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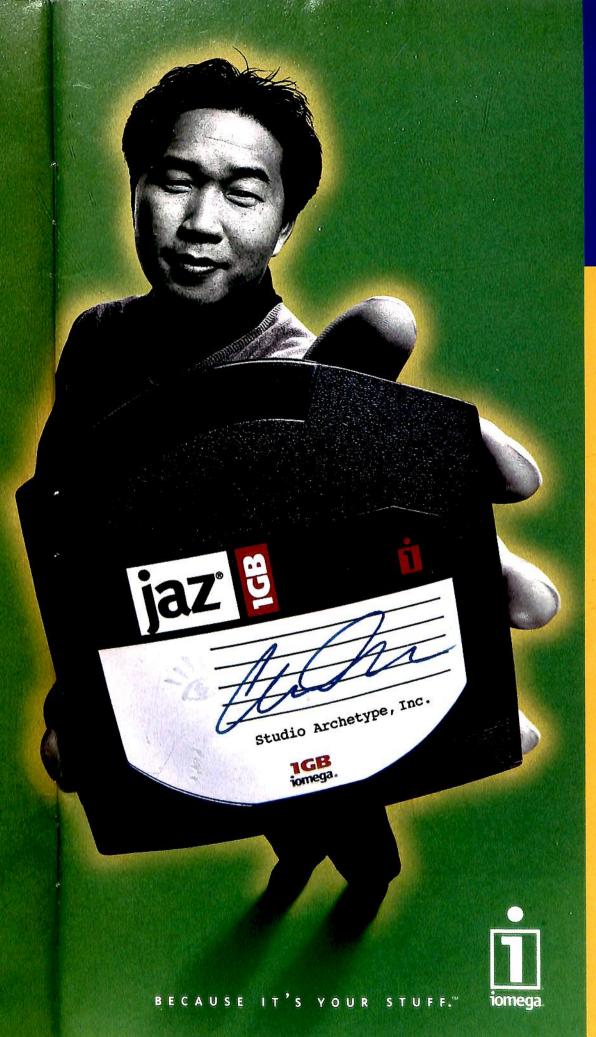
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Information Architect Studio Archetype, Inc.

Clement Mok is an idea guy. As creator of award-winning corporate identities and design solutions for companies like Microsoft, Twentieth Century Fox, Herman Miller, as well as Apple Computer, ideas are the capital of his three companies. Whether he's creating a cyber themepark, compiling tons of stock photos, or designing the elaborate kingdom of Valhalla for the local opera, his ideas need space. Big space. Which is what he gets with the high-capacity Jaz drive.

So while his office resides in San Francisco's warehouse district, his ideas reside on handy, removable Jaz disks. Check out more of Clement's story at www.4inchsquare.com/3dd.

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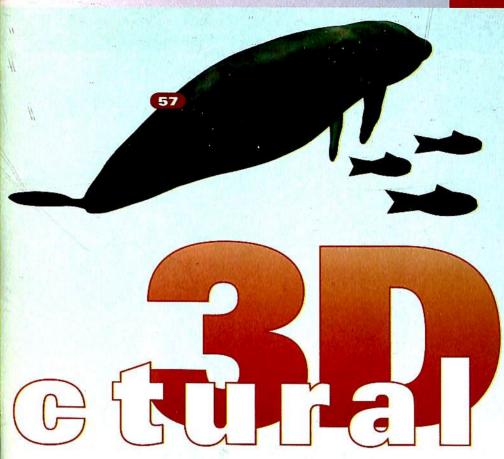
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**FEATURES** 

**Architecture with a Twist** 

Architecture and fantasy worlds collide in Activision's Zork Grand Inquisitor. See how savvy design skills, an active imagination, and incredible CG artistry all come together to create 3D adventures that are beautiful and functional. by Eni Oken

**Storage Solutions** 

So much to store, so many solutions. See how storage systems from companies such as Cybernetics, Imation Enterprises, Iomega, Ontrack Data Intl., Quantum, SyQuest, and Western Digital are changing the way we transfer, archive, and communicate in multiple dimensions. by Chris Tome

Metaballs are an ideal way to give 3D models an organic look and feel. See how RAYflect Blubble, a new plug-in for Ray Dream Studio, opens up new avenues for creating interesting 3D characters with plenty of shape. by Douglas A. Sahlin

Are you ready to get away from flat 2D worlds and give your architectural design more dimension? We've uncovered products from A.R.T., auto•des•sys, Diehl Graphsoft, Kinetix, and Virtus that offer effective 3D design options at prices under \$2,000

COLUMNS

Plugged-In

All the Right Moves. Who says you can't teach an old character new tricks? With a little help from REM Infografica's ClothReyes plug-in for 3D Studio MAX R2, you can lead your favorite 3D characters to the cutting-edge in no time at all. by Barrett Fox

**CAD** Zone

The Fine Art of Surfaces. You've incorporated 3D visualization into your latest CAD project but need to add realism to your final rendering. With a focus on perspective, color, lights, and materials, you can throw a visual punch to your 3D scene using AutoCAD R13.

by Richard Christin

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THE

Activision, Inc.

LightWave's animated fractal noise maps, you can create blustery skies, sand storms, snow drifts, and much, much more. by Dan Ablan

**Third Dimension** 

Wind Power. If your next ani-

mation project calls for some

cutting-edge wind effects, look

no further. With a little help from

COVER: Image created by Eni Oken for Zork Grand Inquisitor ©1997

**Shapely Surfaces** 

IN THE LAB

3D Architecture on a Budget

by Emmanuel Garcia and Teresa Woods de Garcia

#### LightWave 3D 5.5

Titanic really shows what computer animation



© 20th Century Fox / Paramount Pictures. Image Courtesy of Digital Domain

II Titanic was big in every way. A big film. A big challenge. And, in the end, a big reward. The trick with the animation was to achieve the look and result James Cameron was going for.

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the more time we have to review and get exactly what we're after. LightWave 3D gives us that time.

LightWave 3D also lets you model, animate, light and render in one package - which speeds up the creative process.

With Titanic, we had a wonderful chance to tell a story...and with LightWave 3D, we had a great means of achieving that.

- Edward Kummer, Vice-President of Digital Operations, Digital Domain



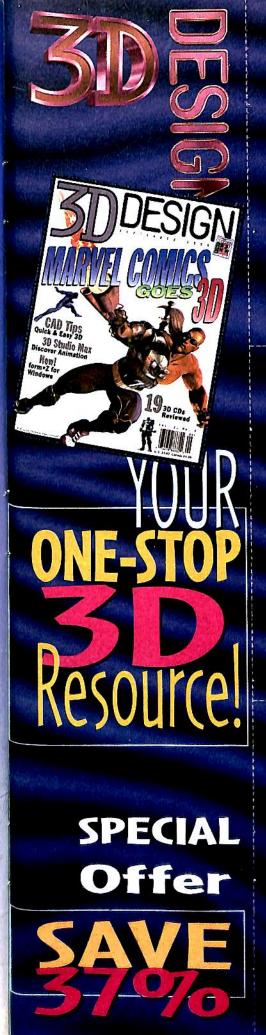
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#### OUT OF MY MIND

#### Fun, Flashy, and Funky

here's no place like Vegas for glitz, gossip, good parties, and a monster tradeshow-and-effects rally. The monster show I speak of is NAB '98, the National Association of Broadcasters, which brought hundreds of devoted communications and multimedia professionals to Sin City once again for the broadcast industry event of the year.

Even before my arrival in Las Vegas, I felt in the know. While sitting in the San Francisco airport, I happened upon a handful of

artists from Digital Domain (DD) and Industrial Light & Magic (ILM) who were talking about life inside the studios and future projects. It made me wonder what's next. Now that Titanic has captured the attention of Hollywood and the world, what will the CG gurus at DD create next? Or, will they take some time off to bask in the golden glow of Titanic's 11 Oscars before tackling another project? My query was soon answered. According to one of the DD employees hanging out in the airport, Cameron is considering the producer role for the upcoming movie Planet of the Apes. However, Cameron's DD is expected to begin work on a B-type sci-fi movie. ILM, according to the ILM employee, is said to be bidding on Frankenstein and The Mummy.

Speaking of movies, I'm proud to say that while at NAB, I was the first person to preview the trailer for the upcoming all-CG movie Blue Planet. Produced and created by Phoenix-based Rainbow Studios, Blue Planet is an all-3D CG movie that takes place entirely under water. The film is full of amazing special effects and some fascinating, seaworthy ships. It's being created with LightWave on NT workstations and even at this



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early stage is quite impressive.

The talk of the show, aside from all the great new product announcements, was the "Funk You" party hosted by Intergraph, Softimage, and Iomega. This bash, which was held at Vegas' hip and

trendy restaurant. Drink, brought hundreds of people to get funked by musician George Clinton. The following night NewTek held its annual beach party

at The Beach, a raucous dance club, to celebrate the launch of two new products-Inspire, a consumer-level 3D design and animation program, and Aura, a new video editing software solution.

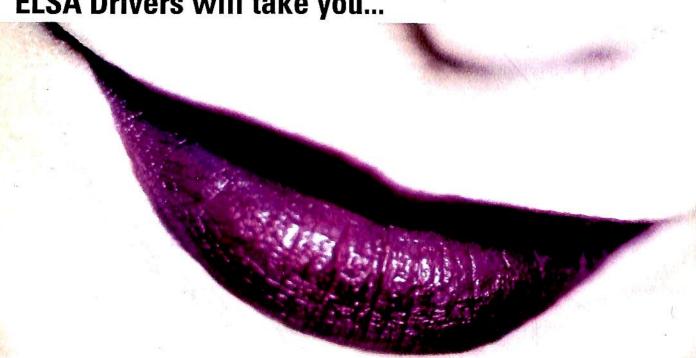
It appears Play, makers of the Snappy camera and the much-ballyhooed Trinity, has taken a shine to Electric Image: the two companies are destined to become one. While Play's purchase of Electric Image has not been finalized as of this writing, the transaction should be sealed by the time you read this. According to Jay Roth, president of Electric Image, the two companies were still working out the details of the new family tree prior to NAB, and once an agreement is reached, it will be business as usual as Electric Image moves forward with the long-awaited version of ElectricImage for NT.

Plenty of new products were announced at NAB, which we'll be covering in more detail next month. It's a fun, flashy, and funky time in the industry, and it promises to become even more so as we race toward SIG-GRAPH '98 and prepare for 1999.

Kelly Dove

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#### Pump up the volume

ve been reading 3D Design for several months now and have been enjoying it so far. However, I've noticed there is little or no coverage of the audio side of things. It doesn't matter how good an animation is-without a soundtrack, it's only half an experience. I'm in the video business, and I'm used to delivering complete projects with picture and sound. I'm wondering if it's a different story with animation. How important is it for animators to be equipped to provide audio production to their clients? If they are unable to provide that service themselves, what role should they assume in coordinating an alternative?

Jeff Hall

QUITE UNUSUAL PRODUCTIONS

You are quite right, audio is an extremely important part of creating effective animations, whether for broadcast, film, games, or other media. While we focus primarily on the visual side of things, your point is a good one. We've discussed the possibility of including coverage of such topics as lip-synching a character with a dialogue track, dubbing audio to a demo reel, and so on, in addition to looking at audio products that would be of interest to 3D designers and animators. As they say on the radio, stay tuned. Chris Tome

TECHNICAL EDITOR

#### I'm ready for my close up

m writing in regard to the article on Maya in your March issue ("Maya Up Close," by Chris Tome, p. 32). I currently use Maya but am sort of blindly grasping my way through. I have a background in 3D Studio MAX and haven't used Alias Wavefront or Softimage before, so the whole thing is new to me.

I was wondering if you knew of anywhere I can get some additional documentation on Maya, over the Internet or elsewhere. I only use the animation module, and the technical directors at my place of work have already set up the

Maya Embedded Language (MEL) scripts and so on, so animation is a breeze. I just want to know what it is breezing over.

> Terri Selting VIA THE INTERNET

Because Maya was released fairly recently, there is not much available in the way of training resources except for what has been produced by Alias Wavefront. Keep surfing the web periodically using your favorite search engine, and make regular visits to the Alias Wavefront site (www.aw.sgi.com). And definitely keep checking the pages of 3D Design for upcoming tutorials.

Chris Tome

#### What a card

installed an ATI All in Wonder card and have since had problems using certain graphics programs. With Bryce 3D, form•Z, and sPatch, I get the following error message:

invalid dynamic link call to a .DLL file I wrote to ATI and they sent me the specs on their video card, but it was all too complicated for me. I'd appreciate any help you can offer.

> Steve Holmes VIA THE INTERNET

The problem you are having could either be Direct3D or Windows-related. Because it is happening in multiple applications, it is most likely not a problem with the software or the graphics card. My suggestion would be to download the updates for Direct3D and Windows95 from www.microsoft.com, and with a little luck and a quick reboot, you should be fine. Chris Tome

#### More on Maya

m using Strata on a Mac but am thinking about making the leap [to SGI and Maya]. Is Maya designed for people who want to focus on using the scripting language, or can a hobbyist tap into its power and have fun with the software? Also, is the rendering speed on an SGI O2R10K about the same as on a Mac, MHz for MHz? For example, would

an animation created using Maya on the SGI O2R10K take about as much time to render as the same animation created in ElectricImage using a Mac with the same CPU speed?

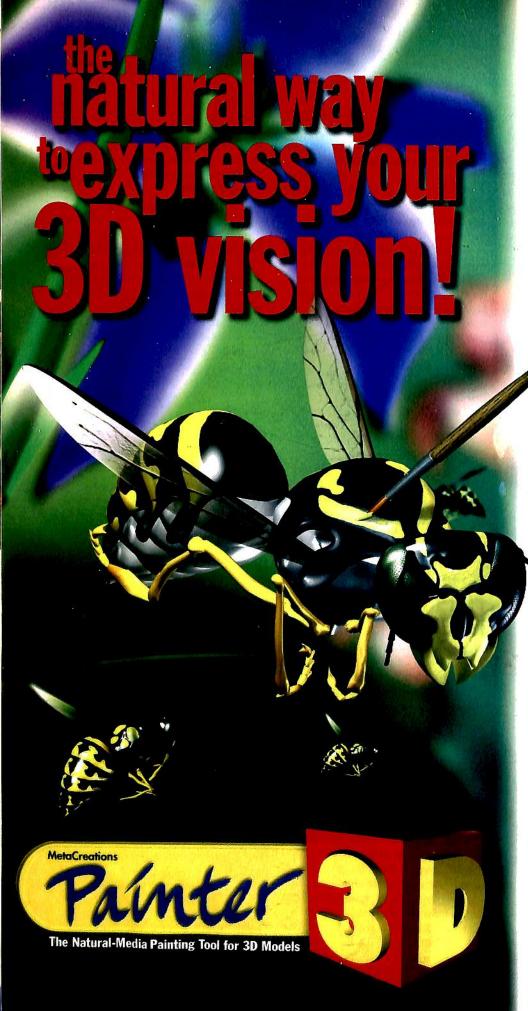
> Dennis Scott VIA THE INTERNET

As far as rendering speed is concerned, the O2 isn't necessarily considered a powerhouse—its best feature is its interactivity while actually using the software (such as in OpenGL screen redraw), which is much better than the performance you would get on a Mac. Maya is for animators first and foremost, but its functionality can be extended dramatically (procedural animation, for example, is handled more easily using MEL scripts, which are fairly easy to learn). Chris Tome

#### SETTING THE RECORD STRAIGHT

- . In the Letters & Feedback section of the March issue (p. 9), the statement was made that version 6.0 of NewTek's Light-Wave is due for release "fairly soon." According to NewTek, no plans to release LightWave 6.0 have been made.
- On p. 16 of the March issue, Anaheim, CA-based CalComp Technology Inc. was incorrectly listed as a subsidiary of Scitex Corp. in regard to an OEM arrangement with IRIS Graphics. (IRIS Graphics is a Scitex company.)
- On p. 20 of the April issue, Mettle Communications was incorrectly listed as the distributor of Foundry 3D Products for LightWave. The correct distributor and developer is Forge Technology (514-861-9613, www.forge.net).
- In the May 1998 Third Dimension column ("Deformations Do the Job," by E.W. Swan, p. 78), the price for trueSpace3 was incorrectly listed as \$2,995. The correct price is \$495.

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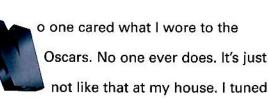
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#### THE LATEST NEWS ON THE 3D SCENE

by Gretchen J. Bay

# And the Winners Are...



in, as always, with a few friends, plenty of snacks, and a flexible dress code. And while none of us takes the Oscars all that seriously, we

share the general opinion that the Academy Awards—by no means the ultimate authority on what represents true artistic achievement in filmmaking—reflects a certain consensus about what the film community at large deems the most wellmade (and of course, commercially successful) motion picture of the year. It's also fun to check out the clothes.

Not that there were going to be any surprises, fashion or otherwise. With 14 nominations, no one really doubted that James Cameron's epic Titanic was going to make a killing, so all in all, it seemed like any other awards year. It wasn't until Rob Legato, Digital Effects Supervisor for LAbased Digital Domain. accepted the Academy Award for Best Visual Effects, that it hit me: If Titanic won, it would not

only be the first movie incorporating extensive 3D effects to win Best Picture, but actually, the first truly big "effects" picture ever to win. And win it did.

After the show had ended (nearly half an hour over schedule), I got out my fullcolor, coffee-table-quality Oscar book to investigate. Not surprisingly, there haven't been a great deal of special effects movies nominated for Best Picture. Even Stanley Kubrik's groundbreaking 2001: A Space Odyssey (1968) was overlooked in this category, with nominations only for writing, art direction, and visual effects (the latter of which it won). Movies considered big effects pictures tend not to be nominated unless there's a pretty solid and compelling story line along with the innovative use of special effects. Examples

include Star Wars (1977), and ET the Extra-Terrestrial (1982), with classics such as The Wizard of Oz (1939) and The 10 Commandments (1956) also receiving Best Picture nominations but not taking home the gold.

And although Best Picture winner Forrest Gump (1994) employed extensive use of CG special effects, such as a particularly innovative use of bluescreen technology and some elaborate 2D compositing, it's still not widely considered an effects picture per se.

Enter Titanic. Tying the previous record holder Ben-Hur (1959) for a total of 11 Academy Awards, Titanic represents a milestone not just in the 3D design industry, but in the film community at large. With a record 15 weeks as the top-selling film in North America, Titanic surpassed all records in box office sales, sailing past previous box office champ Star Wars, which achieved \$461 million including re-releases. Titanic's sales exceeded \$500 million in North America, raking in an estimated \$1.3 billion worldwide.

And none of it would have happened without the use of 3D technology. In addition to Digital Domain, *Titanic* included 3D effects from bi-coastal effects house Blue Sky|VIFX as well as Northern-California-based Industrial Light & Magic and Banned from the Ranch. The 3D software, which facilitated the elaborate creation of photo-realistic digital people, water, and smoke, not to mention the ability to recreate the magnificence of the ship and its ultimate capsizing, included Prisms, Softimage, Arete, Light-Wave, Alias, and more.

The Titanic phenomenon that boosted the March 23 Academy Awards telecast to ABC's highest ratings in 15 years not only sets a stunning new standard in visual technology, it elevates the status of elaborate 3D effects in films beyond that of mere eye candy. This film represents a major achievement for the 3D design community that has been the result of countless hours of creative effort and innovation. In a way, when Digital Domain's Legato accepted his Oscar at this year's Academy Awards ceremony, it felt like a victory for 3D designers everywhere, and one that will continue to serve as an inspiration for years to come. Not to mention that he looked pretty sharp in his suit. 30

Gretchen Bay is the associate editor of 3D Design.

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Compiled by K.J. Van Hooser

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The PowerMate Professional 9000 from NEC is a Windows NT workstation that's dual-processor ready with Intel Pentium processors up to 333Mhz. PowerMate Professional 9000 also features AccelGraphics' AGP subsystem, 512KB L2 SDRAM cache, and support for Ultra DMA hard drives in capacities up to 8.4GB, or an Ultra Wide SCSI hard drive with 9.1GB capacity. Pricing starts at \$2,499 and the workstation is available built-toorder. Contact NEC at 650-528-6000. (www.necnow.com) **READER SERVICE NO. 152** 

#### **IRON OUT THE WRINKLES**



Based on Design Flow Architecture, IronCAD software from Visionary Design Systems is a solid modeling tool offering a drag-anddrop, solid modeling environment. Design Flow Architecture enables all collaborators to share in a concurrent design process regardless of which CAD

system was used to create the object. IronCAD features TriBall, a graphical tool for object positioning by translation, rotation, or any complex 3D transformation. IronCAD runs on Windows NT/95 and is priced at \$3,995. Contact Visionary Design Systems at 408-969-8000. (www.ironcad.com) **READER SERVICE NO. 153** 

#### **ZAPPA LIVES**

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audio software engine is available from AliaslWavefront. The engine is called Zap!iT and can be used to capture, review, modify, and output content. Features include real-time capture of audio and image files directly to the desktop, realtime desktop playback to review or modify uncompressed images files, and direct from disk playback. Zap!iT pricing starts at \$2,995. Contact Alias|Wavefront at 416-362-9181 or 800-447-2542. (www.aw.sgi.com) **READER SERVICE NO. 154** 

#### GO FOR A DRIVE



Panasonic Communications & Systems Company has

#### ANIMATED SPIRITS

s a tool aimed for use by graphics artists, multimedia developers, and

web designers, Inspire 3D from NewTek Inc. offers an interactive, multimedia tutorial designed to make users instantly proficient with this animation software tool for modeling, surfacing, lighting, animating, and rendering 3D images. Features include: compatibility with Photoshop, QuarkXPress,

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**Power Macintosh** platforms, Inspire 3D includes hundreds of interactive 3D clip art items. objects, and fully animated scenes, and is priced at \$495. Contact NewTek Inc. at 210-370-8000 or 800-843-8934. (www.newtek.com) **READER SERVICE NO. 151** 

released a 32X CD-ROM internal drive, the LK-MC682BP, which has a maximum transfer rate of 4800KB per second and a 65ms access time. The LK-MC682BP can be installed in any 5.25-inch bay and mounted horizontally or vertically. The drive is priced at \$99 and supports DOS version 6.3 or higher, MS-DOS 6.2 or higher, Windows 95. Windows NT 3.5 and higher, OS/2, 2.1/2.11, and Warp 3 and 4. Contact Panasonic Communications & Systems at 201-348-7000. (www.panasonic.com/alive)

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#### **NEW&IMPROVED**

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Roto from Post Digital is a real-time painting, rotoscoping, and special-effects program designed for videoproduction companies involved with film, broadcast, multimedia, and Internet content creation. Roto offers real-time video playback, non-destructive video painting, support for an unlimited number of video, paint, objects, and matte layers, and automation tools to create chromakevs. mattes, and alpha channels. Roto runs on Windows 95, NT 4.0, and Power Macintosh and is priced at \$995. Contact Post Digital at 408-469-7678. (www.postdigital.com) **READER SERVICE NO. 156** 

#### **NEW STRATAGEM**



Strata has upgraded its StudioPro 3D software to include support for OpenGL velocity graphs and network rendering. Version 2.5 enhancements include four types of path spleens, individual frame visualization. cycle back-and-forth attributes, continuation of paths. and time-varying polymesh, collision detection of particle effects, such as PixieDust and Fountains. Strata will release Power Module plugin extensions for StudioPro

2.5. Power Module 1 includes Deform, Smooth, Mirror, Hair, and 3D Fire&Smoke. StudioPro 2.5 runs on Windows and Mac formats and is priced at \$1,495. Contact Strata at 800-787-2823 or 801-628-5218. (www.strata3d.com) READER SERVICE NO. 157

#### IANDI

Structural Dynamics Research Corporation (SDRC) has upgraded its I-DEAS Master Series software. I-DEAS Master Series 6 enhancements include new section meshing tools to analyze geometry from I-DEAS and other CAD systems, a new flowline machining function, automated holemaking operations, greater control over toolpath connections, and four new entry and exit functions. The software will also support integrated network data management capabilities. I-DEAS Master Series 6, which runs on UNIX and Windows NT, starts at \$5,000. Contact SDRC at 513-576-2400. (www.sdrc.com) **READER SERVICE NO. 158** 

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at 203-882-5860. (www.orthocadd.com) READER SERVICE NO. 159

#### **CORE OF THE MATTER**



Core Microsystems has added a non-linear video capture and editing workstation to its line of workstations. The DVPro 333 workstation has a 333MHz Pentium II processor, 256MB system memory, the FAST AVMaster audio/video capture board, a 9GB Cheetah dedicated AV Drive, the Oxygen 202 OpenGL accelerator with 16MB, and a 21-inch SVGA display. The included audio/video capture card runs under Windows NT/95 and has S-Video and composite input and output. The DVPro 333 is priced at \$7,995. Contact Core Microsystems at 800-886-2752 or 408-383-9090. (www.coremicro.com) **READER SERVICE NO. 160** 

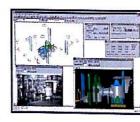
#### TWO FOR THE ROAD



Photoshop 4 users now have two instructional videotapes from Desktop Images. Photoshop Essentials and Photoshop Creative Compositing both include a time-coded reference card to locate subject matter. Photoshop Essentials runs 120 minutes, is priced at \$54.95, and provides an overview of

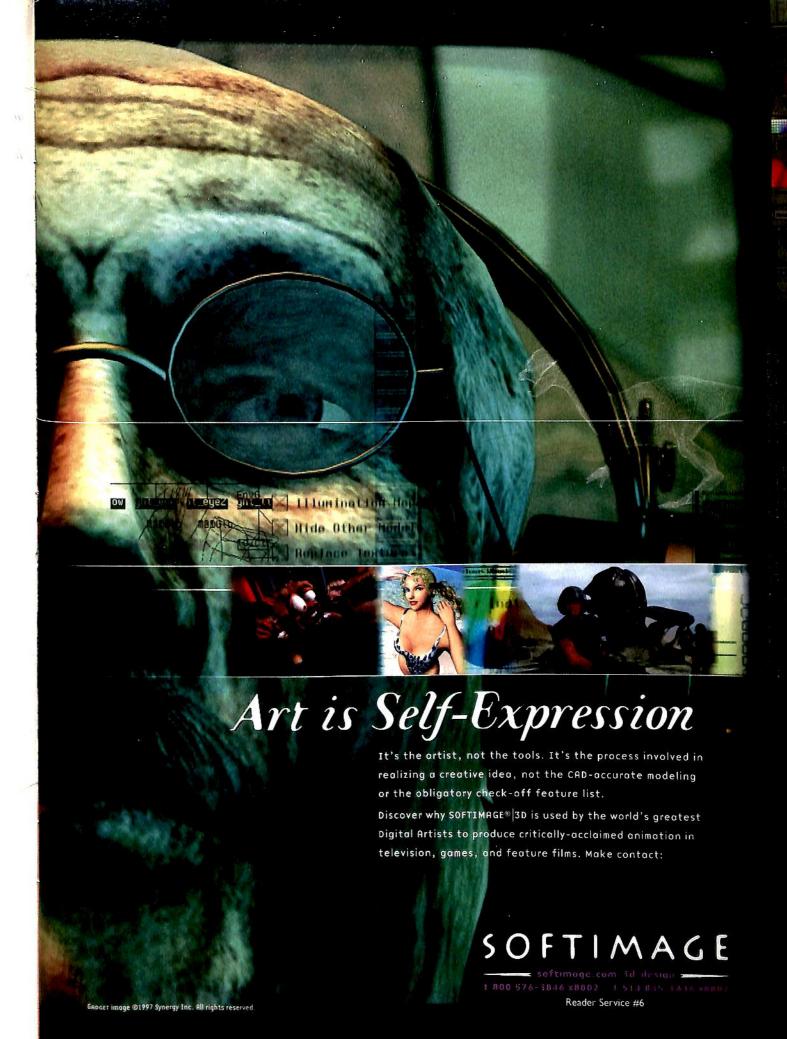
Photoshop 4. Photoshop Creative Compositing runs 110 minutes, is priced at \$54.95, and provides an extensive profile of Photoshop 4's layering and Blending features. Contact Desktop Images at 818-841-8980. (www.desktopimages.com) READER SERVICE NO. 161

#### INTERCONNECTED



A link has been established between form•Z and Lightscape-the release of formez 2.9.5 will have a direct exporter to the Lightscape preparation file format (.lp). Also new for Lightscape is a library series that includes hundreds of Lightscape-ready objects. materials, and lighting fixtures which can be dragged and dropped into scenes. LSnet is Lightscape's new network rendering utility. Both the Lightscape Library and LSnet are available as apart of the Lightscape Productivity Kit, which includes Lightscape 3.1 and is priced at \$795. Lightscape 3.1 without the Productivity Kit is priced at \$495 and runs on Windows 95/NT. Contact Lightscape at 408-342-1900. (www.lightscape.com) **READER SERVICE NO. 162** 

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## All the Right Moves

hose of you who have been faithfully reading 3D Design since its advent may remember a little girl character from the third issue ("Characters with Character," by Barrett Fox, January 1996, p. 89). Inspired by my wife Deana's inner child and filtered through my years of comic book saturation, Deanomatopoeia (pronounced dee-ahn-oh-maht-ah-pee-ah) is an enthusiastic storyteller. She punctuates her stories with comic book onomatopoeias, which fly out of her mouth involuntarily.

Deanomatopoeia is largely composed of what I call "legacy polygons." Her dress was originally modeled in Animation Master v. 3, with inner various body parts modeled in 3D Studio R4 using the MetaReyes metaball modeler. Later, when 3D Studio MAX and Character Studio came out, I used them to animate Deanomatopoeia for a project. Character Studio, now in version 2, includes Physique, which is a skeletal deformation modelerk, and Biped, an footstep-driven animation plug-in using an inverse kinematics (IK) skeleton. Physique was used to tie all the vertices of her mesh to the Biped skeleton. Even her pigtails are animatable using MAX's standard bones and Physique to bind of vertices to them. These bones are then attached to the Biped skeleton. Figure 1 shows the



Deanomatopoeia, the sound effect girl, is back. This time with a realisticlooking dress, thanks to ClothReyes.

original wireframe structure of Deanomatopoeia.

Since the birth of Deanomatopoeia, 3D Studio MAX R2 has arrived on the

Who says you can't teach an old character new tricks? With a little help from REM Infografica's ClothReves plug-in for 3D Studio MAX R2, you can lead your favorite 3D characters to the cutting-edge in no time at all.

scene, along with version 2 of REM Infografica's ClothReyes plug-in, both of which I wanted to put through their paces bringing Deanomatopoeia into the modern age. Physique had done a pretty good job of controlling the vertices of the entire character, but ClothReyes can add a further dose of realism to the shirt and dress objects' behavior. There is a trade-off with the ClothReyes set-up because it can be a little tricky, but is offset by the fact that the set-up doesn't need to be done very often. Once the ClothReves simulation is working properly, you can concentrate on the character movements and let the fabric simulation do a lot of the work. Following are some of the steps I took and some of the tricks I picked up along the way for using ClothReyes and Character Studio together.



It offers an extensive array of unique 2D and 3D form sculpting capabilities. Grow a model from simple lines to complex surfaces or to true solids with a few quick clicks. Shape curved splines or NURBS surfaces as you slip effortlessly between 2D and 3D views. Resize your shape, stretch it, extrude it, lathe it, sweep it, project it, unfold it deform it, apply advanced vertex and edge rounding to it. Use metaformz, smooth meshing, image-based displacements, or multi-source, multi-path skinning to create smoothly blended organic forms. What's more, form • Z's Boolean operations work even better than those found on pricey workstation level modeling packages

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always managed to keep pace with

our requirements as we continue to

Raymond Wong, 3D Modeler

it in form. Z.

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I hadn't opened the Deanomatopoeia model in over a year, and even with its Biped and Physique components from Character Studio 1.0, the model opened up in MAX 2 just fine. The first thing to do was to remove the Physique modifier from the modifier stack for the two dress objects, the shirt and the skirt. Even though I had originally applied the Physique modifier just once to the entire group that comprises Deanomatopoeia's mesh, removing Physique from the individual modifier stacks left the other objects that make up her body intact. This was a relief because

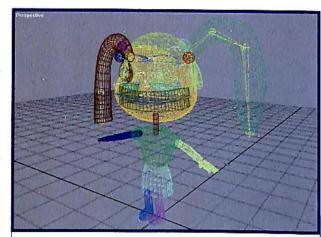


FIGURE 1. Deanomatopoeia's wire frame.

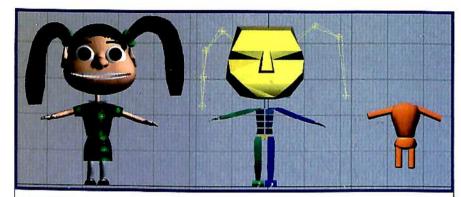


FIGURE 2. The components that comprise Deanomatopoeia: 2a. Her textured mesh. 2b. Biped and pigtail bones. 2c. The simple mesh used to collide with her dress for the ClothReyes cloth simulation.

setting up the Physique modifier can be a time-consuming process (see Figure 2a and 2b).

Next, it was time to set up the ClothReyes simulation, which involved assigning the plug-in to the pieces of geometry that would be animated by a cloth simulator. But before this could be done, Deanomatopoeia had to have a body underneath her dress. Previously, she had no need for a body because it was hidden by her dress. All she had were arms and legs with the dress standing in for torso and waist. But the cloth simulator achieves its realism by using real world physics equations such as friction, gravity, and collision. If the simulation were run now, Deanomatopoeia's dress would simply fall in a heap to the floor over the course of about 10 frames, tragically exposing her lack of a body.

ClothReyes' cloth simulator not only keeps the polygons of the dress objects 3D Studio R4
3D Studio MAX
Character Studio
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San Francisco, CA 94107
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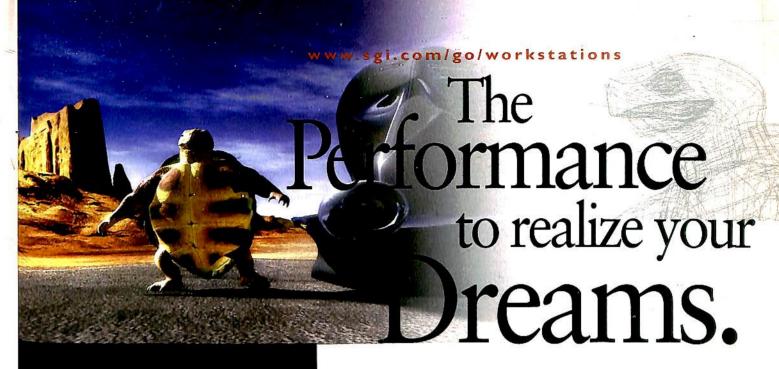
from self-intersecting as it wrinkles, it moves the fabric in coordination with other objects in the scene. You can create a seamless mesh for a character's body to drape the fabric objects over, but calculating the collisions of each and every polygon of your fabric with all of the polygons of your underlying character can quickly drag even the most powerful machine to its knees. So I created a simplified, low-polygon body consisting only of upper arms, thighs, torso, and waist

thighs, torso, and waist specifically to collide with the fabric of her dress.

For the thighs and upper arms, I used cylinder primitives because any more detail would not show through the fabric. For the torso and waist, I started with spherical primitives and applied edit mesh modifiers. I sculpted these primitives by moving and scaling the vertices to fit within the already modeled dress. These objects could then be linked to the Biped skeletonthigh to Biped thigh, upper arm to Biped upper arm, and so on. This way, this collision skeleton would animate along with the Biped. These objects are hidden when the animation is rendered (Figure 2c).

Next, I created a few footsteps for the Biped object and activated them. Then I keyframed some arm movement to go along with the motion that had been roughed out by the Biped object when its footsteps were activated. These arm gestures helped to reveal some of Deanomatopoeia's personality, that of a very energetic eight and a half year old. I created about 120 frames of animation to act as a screen test for Deanomatopoeia's new dress.

Now the ClothReyes scene could be created (it's worth noting here that a ClothReyes scene is different from a MAX scene and refers specifically to those objects that are part of the ClothReyes simulation). After selecting the collisions, skeleton objects, and the two dress objects, I added the ClothReyes modifier by selecting it from the More list in the Modify panel (Figure 3). Upon clicking the Make Scene button, I was presented with a



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dialog box for naming the ClothReves scene. This was followed by dialog boxes for each selected object, allowing them to be designated as fabric objects or not. Only the two pieces of the dress became fabric objects, leaving the other objects rigid. All other objects in the MAX file were ignored by ClothReyes. Because none of the other objects needed to interact with the fabric objects, an enormous amount of time was saved by not calculating for them.

The next step was to start the simulation's calculation process for the frames I wanted to animate. Before this could happen, I had to make sure that none of the objects in the ClothReyes scene were intersecting the two fabric objects. The heart of ClothReyes' magic is that it keeps polygons from passing through each other during an animation. If the initial frame of the animation contains intersecting polygons, then it will start

with an error in its calculations. Of course, the model had originally been created with Deanomatopoeia's arms outstretched and legs straight, but when footsteps were activated for the Biped object most of the joints became repositioned. This caused the upper arm and thigh collision cylinders to pass through the still straight sleeves and skirt of the dress.

To correct this, I opened Track View and lengthened the number of frames in which the Biped object's feet were on the ground. This is done by opening the Footsteps track and dragging the end of the first two (one left, one right) footsteps' keyframes to frame 10 of the animation, thus keeping the legs straight and from intersecting the skirt for the initial few frames of the cloth simulation. I also made sure that the arms started out very close to their original outstretched position, which the dress was modeled around.

Another trick that helps in this instance is to link the fabric objects to their corresponding collision objects. I linked the top of the dress to the collision torso and the bottom to the collision waist because Biped also moves these parts of the character when footsteps are activated. The fabric objects don't need to be linked to anything because they are pushed along by their collision objects. For the purposes of keeping the first frame clean of intersection, however, this saves a lot of manual repositioning.

Now for what I thought would be the cool part-watching the embodiment of ClothReves' rocket science fabric simulation algorithms. I clicked the Start Calculation button and chose to calculate the first 20 frames of the animation. When I played the animation back in the viewport, I watched in horror as Deanomatopoeia's skirt slipped off and fell to the ground. My wife, who happened to be watching, did not appreciate this, and I was rather embarrassed. Luckily, ClothReyes provides a solution for such improprieties.

With one of the fabric objects selected (any or all of the objects comprising the ClothReves scene can be selected to access the modifier), I clicked Sub-Object in the Modify panel. Here, I was able to select and group certain vertices and attach them to the underlying skeleton objects. I attached the top vertices of

the dress around the collar to the torso object and the top row of vertices in the skirt to the waist object, anchoring those vertices while allowing the rest of the fabric objects to drape, wrinkle, and move freely.

The next time I calculated the start of the animation, I gazed in wonderment as the dress realistically fell from its original position, suspended in space as if it were inflated, and drape itself loosely over the newly created collision skeleton. With ClothReyes, you should provide 10 frames or so before the beginning of your actual animation for gravity to take effect on the cloth (Figure 4a and b).

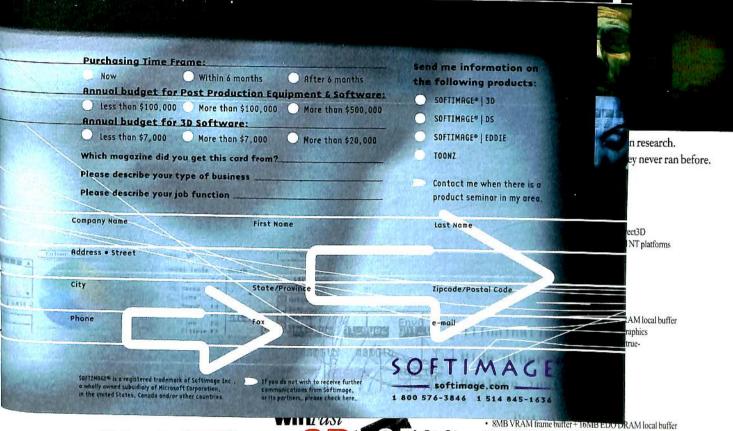
With this accomplished, the rest of the animation could then be calculated. The Start Calculation dialog box allows you to specify any range in your animation to be calculated. This way, it is possible to simply add-on to the sections that have already been calculated or to recalculate sections for which the character's motion has been changed. On my Pentium II 233MHz machine with 96MB of RAM, it took me a couple of hours to finish calculating the animation. You could definitely tell that there were some highly advanced calculations happening. But ClothReyes provides flexibility in the thoroughness of its calculation. Notably, it allows fabric self-collisions to be ignored to save time. For Deanomatopoeia, the only place where self-collision happens is under the arms-where it is not noticed anyway. Turning this off reduced calculation time quite substantially.

Being able to shorten the time for calculations really helped when it came to testing the effects of the fabric area's parameters. The Fabric Parameters dialog box appears when you click the Make Fabric button. I used all the defaults and got an acceptable result, but there are quite a few different parameters that interact to form myriad variations in the fabric's behavior. Fortunately, REM Infografica has done an excellent job with its documentation, which does much to demystify the various fabric settings. With them, you can simulate everything from leather to silk.

When your cloth simulation has been completely calculated, you'll have a basic MAX object that has been keyframed for you. It is possible to modify and animate anything else in

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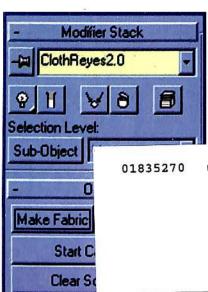


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FIGURE 3. The Cli modifier panel.

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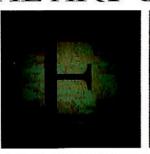
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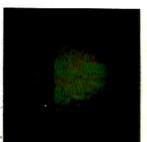
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FIGURE 4a. Deanomatopoeia's dress as it was originally modeled.

the scene without having to recalculate the cloth simulation as long as that object does not need to interact with the fabric. So as long as you don't

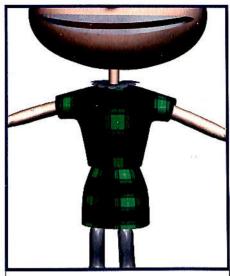


FIGURE 4b. The dress after 10 frames of cloth simulation calculated.

change the character's keyframes, you have a lot of flexibility in how you texture and render your character. Once her dress was animating properly. I was able to round out the rest of Deanomatopoeia's personality. The most important part of bringing characters to life is revealing their emotions through expressions and gestures. So I animated her eyes, lids, brows, pigtails, and face to let her personality loose.

Character Studio and ClothReves together provide an excellent foundation for an expressive animation. They allow character animators to focus on their craft-making the character emote by automating what can be the more tedious parts of the animation process.

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Barrett Fox recently co-founded San Francisco-based infoplasm, an internet 3D studio. Contact him at pajamas@sirius.com.

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#### C A D



#### Z O N E

by Richard Christin

#### The Fine Art of Surfaces

hen last we entered the CAD Zone ("New Dimensions in CAD," by Richard Christin, April 1998, p. 31), a 3D model of a small lobby was constructed in AutoCAD using 2D data as a template for tracing and extruding data into 3D. Layers were created and named for the different elements such as floors, walls, doors, and so on.

The second part of this tutorial will build on the 3D model created in the first part in preparation for the final rendering. Specifically, the focus will be on the steps needed to select perspective views, light the model, and pick color/material properties (see Figure 1). As in the last tutorial, only the commands found in AutoCAD R13 will be used.

SEEING AT EYE LEVEL In the first part of the tutorial, the viewports used to build the 3D model were all plan or isometric views which are suited to the construction process, but learning how to set up an eye-level perspective can add the visual punch needed to sell your design ideas. AutoCAD often allows numerous ways to do things, and using the DVIEW command to create 3D view set-ups is no exception.

To pick your perspective view, set the active viewport to Plan. Select VIEW from the power bar and 3D DYNAMIC VIEW, or type DVIEW at the command prompt and click on the enter key. You'll be prompted to select objects, so type in ALL and hit Enter. Next, a series of command options will be displayed in the command box. Enter POints and hit Enter. When prompted for target point, click on the area you want to look at (for example, the lobby information desk). Next, you'll be prompted to pick the camera target point; click on the area where you want to be standing (for example, the end of the lobby.) Notice that the DVIEW command choices have reappeared in the command line.

Entering the Distance option allows you to roll the camera back and forth by

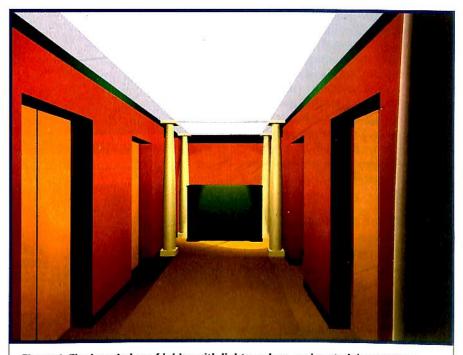


Figure 1. Final rendering of lobby with lights, colors, and material properties.

You've incorporated 3D visualization into your latest CAD project but need to add realism to your final rendering. With a focus on perspective, color, lights, and materials, you can throw a visual punch to your 3D scene using AutoCAD R13.

using the on-screen slider or by typing in the distance between the camera and target. Using the Distance option, the flat elevation-like image has been changed to a three-point perspective. After setting the distance, you have the option to dynamically rotate the perspective view around the target with the mouse (this can be a little disconcerting), or you can use the keyboard by selecting the subcommand Pan which will give you control in centering the perspective view in

the viewport window.

Once a satisfactory view is found (similar to what's shown in Figure 2), save this view by clicking on the main pull-down menu labeled VIEW, select NAMED VIEWS, click on the NEW button, and enter a name for this view, such as Cameral. To restore the view, use your cursor in the NAMED VIEWS dialog box to highlight the view, click on the RESTORE button, and click OK. To return to a plan view, type PLAN and hit

enter in the command box.

Before adding lights and materials, it's important to become familiar with the RENDER command, which contains a dialog box to fine-tune your rendering. To render a view of your model, pick an appropriate view, then type in RENDER and hit the enter key. A dialog box will appear with a number of options, which will be discussed later. For now, we are only concerned with the RENDER SCENE button at the lower left-hand corner. Clicking on RENDER SCENE will cause AutoCAD to render all polygons, 3D faces, and 3D shapes. Any lines or plines not extruded into 3D will not be rendered. You may notice the quality of light on the lobby is very dull and flat (see Figure 3). To add depth and warmth to the rendering, our next step is to add lights.

LIGHTING YOUR 3D MODEL For this part of the tutorial, set the viewport to a plan view. This makes it easier to place the lights initially. At the command prompt, type LIGHT and hit the enter key, and a lighting dialog box will appear. On the lower left side of the dialog box is a button labeled NEW. To the left is a pull-down menu that when accessed has three different types of lights: POINT, SPOT, and DISTANT. Point is similar to a bare light bulb, which casts light in a 360° sphere, and Spot is a directional light, which can be aimed in any direction. Distant is a light that can add daylight-type lighting to a model and will not be used for our interior rendering.

Pick a point light and place it in the main lobby centered between the elevator doors. Select POINT LIGHT, then click on the NEW button and a new dialog box will appear. Enter a name for this light-for our purposes, call it point1-and click the OK button. The original Lighting dialog box will pop up with the light name point1 highlighted in the upper left-hand corner. To place this light, click on the MODIFY button next to the highlighted name and use the cursor to place the light in the model. If you select OK instead, the light will be inserted in the middle of the display screen.

TIP 1: At this point, the size of the light symbol might be too small. You can scale it up 20 times at its insertion point so it's easy to see the symbol and read

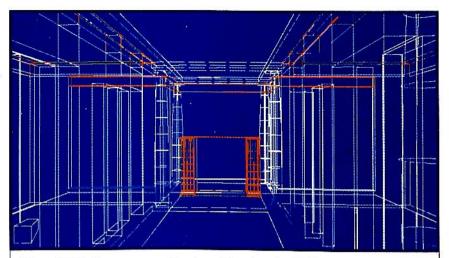


Figure 2. Wireframe perspective view pick using the DVIEW command.

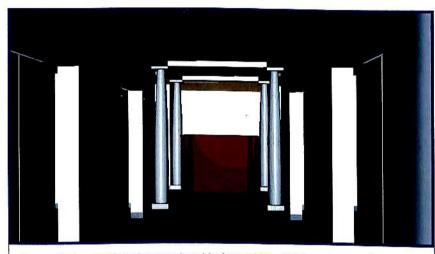


Figure 3. Perspective view rendered before adding lights, colors, and material

the name of the light.

Now, the light needs to be placed about eight feet in the Z direction. To move the light, type MOVE at the command prompt and select the light. For the base point, enter @0,0,0, and for the displacement point, enter @0,0,8 feet, which translated means 0 feet in the X and Y direction and 8 feet in the Z direction.

TIP 2: After placing each light, it is a good idea to test render the lobby to see if the lighting is satisfactory. If the lighting is too dim or too bright, adjust the power of the light by bringing up the lighting dialog box, highlighting the name of the light to be adjusted, then clicking the MODIFY button, which will bring up a dialog box that has controls for the specified light. Here, you will find parameters for adjusting position, intensity, and color.

Next, insert a spotlight to illuminate the wall behind the reception desk. After entering the light, follow the procedure outlined earlier, except choose SPOT-LIGHT as your light type from the pulldown menu. One major difference between placing a spotlight and a point light is that the spotlight has a target point as well as location point to enter. For this reason, it's best to be in an isometric view when adjusting the target point of the spotlight if you plan to snap it to any object in the lobby; AutoCAD does not allow you to snap in a perspective viewport. The dialog box for modifying a SPOTLIGHT also has additional controls for adjusting hotspot (the center part of the spotlight) and falloff (the



Figure 4. Rendering with point lights and Spotlight casting a narrow blue



Figure 5. Here, Spotlight is modified to cast a wider beam of yellow light.

outer edge of the spotlight) parameters. These variables control how concentrated or diffuse the spotlight beam is (see Figures 4 and 5).

TIP 3: For the most dramatic lighting effects, make sure that the render quality Phong has been selected. This can be found in the RENDER dialog box under Screen Pallet by clicking on the MORE OPTIONS button.

TIP 4: Lights cannot simply be added by copying existing lights-you must use the LIGHT command to create each new light.

As you can see, proper lighting is essential for developing dramatic flair in a space. It's not the number of lights used, but how each light is positioned and tuned (see Figure 6). Now that the lighting is set, we can choose materials

and colors to further define the space.

FOR APPEARANCE'S SAKE The last step before creating a final rendering is to pick colors that heighten the realism of our final rendering. Why apply colors and material properties last? Simply because the brightness of the lighting selected will affect how colors and material properties within the model will render—so picking colors and material properties after setting up lights can save you from having to pick

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colors and materials twice.

To pick colors, assign one of the 256 standard colors to a designated layer using the Layer command or, at the command line, type RMAT. Invoking RMAT will bring up the materials dialog box. To add a material, click on the Materials Library button, highlight a material and import it, or click on the NEW button and build a material from scratch. To modify a material, click on MODIFY, which will give you the option to change the following:

- · Color: will let you pick standard Auto-CAD colors or mix your own.
- · Ambient (light): how a material reacts to the surrounding light around it.
- · Reflection: how shiny or dull a material is (for example, its highlight, middle light, and shadow).
- · Roughness: the degree of a surface's roughness.

This dialog box can be quite confusing when trying out different color and material options; however, the PREVIEW button can help by allowing each change of parameters to be tested. All material changes are saved when the drawing is saved.

After a material is created, adding it to the 3D model is easy because the model is built with all the materials separated into different layers. To do this, type RMAT and click on the BY LAYER button. Next, highlight the material and choose the layer the material is assigned to, and click OK. The material is now assigned to a layer.

TIP 5: As you add each material to the model, do a test render to see how the material adapts to the model. Several tries may be required to achieve the desired result.

#### PRODUCING A FINAL RENDERING

Now that you have set up perspective views and added lights, colors, and material properties, it's time to save your rendering to your chosen file format. The first method is to select TOOLS from the main pull-down menu, pick IMAGE > SAVE, and the Save Image dialog box appears. Click on the appropriate file format (TGA, TIF, GIF) and the portion of the screen to save, click on OK, and the file name prompt will appear.

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Figure 6. View of final lighting configuration before application of colors and material properties. Notice how the material properties in Figure 1 affect the reflectance of the lights shown here.

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IN THE ZONE It has been my intent with this tutorial to help introduce a low-cost way to render by utilizing capabilities that exist within AutoCAD. The concepts and commands shown here might seem cumbersome at first, but they can become almost second-nature with a little practice and can help fill a need for quick computer visualization. At the very least, these skills should help you take the first steps towards learning concepts found in higher-end photorealistic rendering packages. 30

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Richard Christin works in the Washington D.C. office of HOK, specializing in computer visualization and animation of projects in design development. You can reach him at richard.christin@hok.com.







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# Architecture

Architecture and fantasy worlds collide in Activision's

Zork Grand Inquisitor. See how an active imagination, savvy

design skills, and great CG artistry all come together to create

incredible 3D adventures with an architectural backbone.

by Eni Oken

industries are moving into the third dimension, including the highly creative fields of architectural

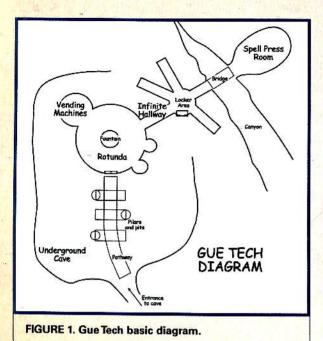




FIGURE 2. Gue Tech, an outside view with the rotating pillars.

visualization and computer game design. But how often do the two collide to create fantasy worlds that are visually rich and full of intrigue? Maybe more often than you think.

As one of several contract artists hired to create the visual effects in Activision's Zork Grand Inquisitor game, the biggest challenge we faced when modeling and animating the game was to keep the high-quality graphics of Zork Nemesis, Grand Inquisitor's predecessor. If you're unfamiliar with the design of Grand Inquisitor it is an unlikely mixture of the traditional, whimsical, mystical, and magical all brought together in an adventure game that leads the player on a journey through numerous environments, while solving puzzles and trying to win the game.

Zork Nemesis won the 1997 Computer Game Developer's Conference Spotlight award for its beautiful, pre-rendered environments. Grand Inquisitor was expected to take Zork Nemesis to the next level by bridging the beautiful with the functional to create fantasy environments that rivaled even the most active imagination. However, director Laird Malamed wanted to take a lighter approach and recapture the whimsy found in earlier Zork games.

#### MAKING IT HAPPEN The details

of how this project was approached, including the design concept for the 3D environments will be covered in this arti-

cle. The software used for my portion of the Grand Inquisitor project was 3D Studio R4; however, the approach of this article will be to describe how the project evolved, without committing to a particular 3D software program.

My role was to develop the environments for an entire section of the game called the Gue Tech, which is basically a "university of magic." The Gue Tech building is located inside an enormous underground cave and is partially invisible to the player when first approached. Once inside the main building, the Rotunda, the player can go to a smaller vending machine area or wander down the Infinite Corridor. The Corridor ends in the Student Lockers area, which contains a door to the Spell Press Lab. Figure 1 shows a rough sketch of how these spaces are connected.

The building itself has magical powers; it is invisible from the outside and appears in its entirety only when the player is inside. Activision wanted Gue Tech to be different from the rest of the game, with a grandeur reminiscent of Zork Nemesis.

The navigation of the game consists of pre-rendered 360° panorama views shot from 3D environments modeled in 3D Studio, pre-rendered sprites, and fullscreen animations. Activision's panorama engine works similarly to QuickTime VR, allowing 360° of vision while the player is standing in one of the pre-determined nodes. The fact that the game is entirely

pre-rendered, unlike low-count polygon real-time games, accounts for the intricacy of the environments.

#### THE CONCEPT OF A

CONCEPT As a 3D artist, I am often given the opportunity to instill my own personal design in my projects. Although Activision provided me with some initial illustrations, I was allowed enough freedom to give personality to the various environments, particularly where textures and colors were concerned.

When starting a project, I usually talk to the client about the mood they want to create. For Zork Grand Inquisitor, Activision wanted the university to look magical, rich, and grand. The 'Zork style' is ancient and eclectic. The time or epoch cannot be determined but projects an ageless, eternal quality. I also had to keep in mind that according to the game's story line, the university was built into its natural environment, an enormous underground cave. The structural columns and walls are surrounded by rocky stalagmites and stalactites. The building needed an organic quality free of sharp edges and corners.

The color scheme I decided upon was gold and faded blue. I usually choose a palette-of two or three base colors along with a couple of neutral colors. I added a little bit of silver and aluminum color to some of the metals, and a blue-gray color for the rock. We wanted it to look grand, so I applied stone carvings on the

walls and massive columns.

#### THE GUE TECH EXTERIOR:

Upon entering this huge underground cave, a player sees a grassy area and a pathway leading to an odd, domed building. The building is just barely visible and what can be seen is minimal. The few visible elements present are a circle of columns with a floating dome above. In the center of the platform is a moss-covered, floating fountain. On the pathway, three bottomless pits with round pillars block direct access to the domed building (Figure 2).

Two kinds of columns were created for the scene: a basic column used under the dome, and rotating cylindrical pillars used to solve the puzzle of how to reach the domed building (Figure 3). I was given a sketch of the columns used in other parts of the game, so I decided to follow the same geometry, differentiating them by using richer textures. If

you look closely, the models are not that sophisticated: the basic shape of the column was created by simply rotating a profile around a circular path. The dents on the base were created by using a Boolean subtraction.

What makes these columns interesting is the number of textures that are applied to them. Three types of materials were applied onto the column faces: a light gold, a creamcolored material with an ornate bump map.

and an ornate metallic-blue border. The materials were alternated to make the object more interesting and appear more complex. A special "worn-out" texture was applied to the rotating cylinders to differentiate them from the rest. The small arrow-shaped ornament on the rotating cylinder is a texture and bump map applied over extruded geometry. The ornament at the top of the pillar was created the same way. This kind of detail work is fairly easy to create and enriches the scene. This technique will be reviewed later on while describing the Rotunda Jewels.

The geometry of the cave was more

complex and was created in two sec-

tions-bottom and top-using the Displace plug-in (which can be found as a regular command in 3D Studio MAX). The Displace command can use a grayscale image to deform a surface: Lighter areas of the image projected on the surface will cause polygons to deform and elevate higher, while black or dark areas will not deform the polygons at all. If the image has enough contrasting white, gray, and black areas, this technique can create some interesting organic shapes. Figure 4 shows the bottom half of the cave, along with the black and white image used to create the deformations. When using this technique, it is important to create geometry with a lot of polygons to allow the deformation to become smoother. In this case, the original geometry was a simple plane, which was tessellated several times to make it more dense.



FIGURE 3. Two types of columns used in the exterior of Gue Tech. The column on the right was also used in the interior of the Rotunda.

#### READY FOR THE ROTUNDA

After solving the rotating pillar puzzle, the player is taken inside the building to the main lobby called the Rotunda. which is a circular room surrounded by nine columns holding the dome and an ethereal floating fountain in the center. The main door opens directly in front of the fountain and from there the player can see the entrances to two other environments: the Vending Machine area and the Infinite Corridor.

Figure 5 shows a portion of the panorama seen from a point of view near the main door. The room looks wider and more spacious than one would expect it to be seen from the outside, but that is due to the magical properties of the environment. Several previously-invisible elements have also appeared, such as the walls, windows, jewels ornamenting the dome, flags, and other details. This room is the high point of Gue Tech.

The Rotunda needed to be grand and spacious, however, I wanted to avoid an empty appearance. To eliminate this problem, I decided to use a layered approach, superimposing elements over existing geometry. Notice how the flags overlap the arches and walls, adding a realistic richness to the environment.

The fountain overlaps most of the back wall, creating a sense of dimension. I used a light blue, distance fog, making the background elements blend into the scene and allowing the foreground elements to stand out. While this technique may not reproduce well in print, it is quite noticeable on the monitor, especially in the vending machine area.

The basic structure of the Rotunda is also very simple—the isometric shot in Figure 6 shows the columns in a circular





FIGURE 4. The cave's bottom half (left), and the grayscale image used with the Displace command (right).



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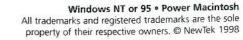
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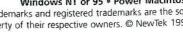
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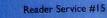
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FIGURE 5. A partial panorama of the Rotunda's interior (from the point of view of the main door).

array. The structure is the same as the one found in the exterior cave. The basic geometry for the arches on top of the columns was built by creating a tube and then subtracting cylinders, using Boolean commands to form the arches.

Notice how certain objects in Figure 6 were grouped with each column to form a basic decorative architectural element: the arch with the jewel, the three gold

leaves supporting the flags, and a lamp. Although each individual object is simple, the result is a complex structural element that was repeated to produce an intricate environment. This method was also used in the Infinite Corridor and the Spell Press Lab. By using this artifice, the environment looks rich and full.

I always try to incorporate ornamental touches and textures to my work whenever possible. For example, the top arches of the dome have ornate bump maps and jewels, which were created separately, then applied. The jewels were created using the same technique as the small detail on the cylindrical, rotating pillars. To create the jewels, I chose an ornate image that had the desired shape I was after, and traced over a rough outline using 3D Studio's spline commands. To make this process easier, I set the image as a background of the current viewport. The shape was then extruded and the decorative image was applied to it as a decal. For the jewels in the Rotunda, I created two different elements using this



FIGURE 6. The Rotunda's columns and details of its iewels.

technique, adding a blue gem made from a regular elongated sphere. A metallic blue material was applied to give the gem its color, and a golden elongated torus was used to finish it.

#### BRING YOUR POCKET CHANGE Attached to the main

Rotunda area is a smaller room containing four machines: three vending machines and a change machine.

Although the Vending Room is empty in comparison with the Rotunda, the vending machines are a great example of how to design fantasy objects. There were no illustrations for these machines, so I designed them from scratch.

The challenge was to create a candy machine that didn't appear to be a plain, refrigerator-like box with coin slots.

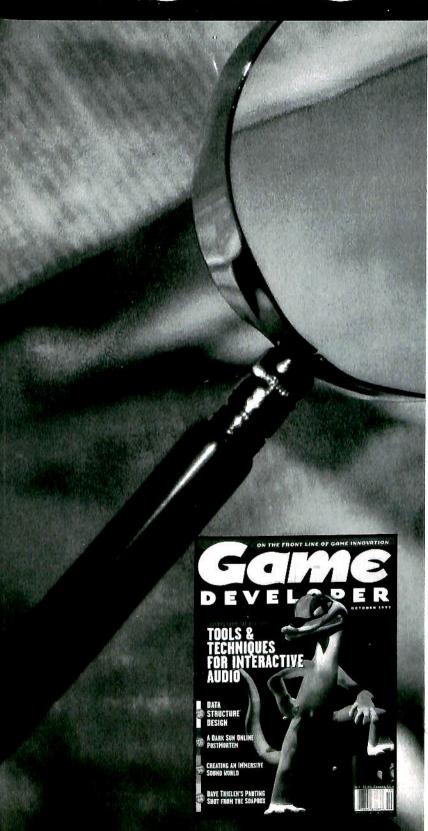
Activision didn't really care what the vending machine looked like, as long as it had the main elements needed for

game-play: candies, mechanical coils. one coin slot, an advertising area, and 12 buttons. I was free to create whatever I felt was interesting, as long as the results made the object recognizable as a vending machine. Figure 7 shows the results: the rectangular shape of a vending machine was modified into a curvy version with a little more style and elegance to it. The top has an open space for a nicely framed advertisement. The middle of the machine contains a window where the player can see candy and the mechanism necessary for game-play. To break away from the rectangular shape even more, I created a high-tech looking panel for the buttons and coin slot.

Figure 7 also shows the ice cream machine, which has the same geometric structure but was created with different materials. The glass of the vending machine is gone, replaced by three ice cream containers. The entire machine is covered with icicles because, according to the storyline, the machine has been frozen for a long time. To form the icicles, I used the displacement technique described earlier in modeling the underground cave. The semi-transparent icicles were elongated and lined up around the edges of the machine to give the appearance of frozen dripping water.

This machine's texture treatment received special attention: instead of simply applying white to it, I added a slight bump map and applied it irregularly by using a black and white mask. The mask works similar to the alpha channel: it filters the texture map, letting only certain parts of it show through. Notice how the white ice fades out into little speckles just below the three ice cream container openings. The frame, the top, and the

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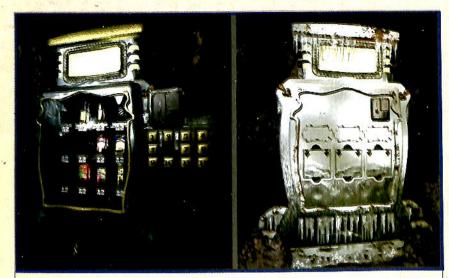


FIGURE 7. The candy vending machine (left) and the ice cream machine (right).

base also have an opacity map applied, breaking even more of the white frozen material.

To create the smooth geometry of the vending machines and the panel, a rough shape was created from a box with several segments, then I manipulated vertices and faces until the desired shape was achieved. The Smooth-Mesh command was applied to obtain the final, high-polygon version. When applied to a model. the SmoothMesh command takes the existing geometry and smoothes the rough edges by adding more polygons and modi-

fying corners. Figure 8 shows how the box progressively changed into the desired shape.

The texture map shown in Figure 8 was hand-painted using Adobe Photoshop and applied as a metallic material. While the texture itself is not particularly sophisticated, its combination with other textures and a light-color bump map achieve the final, complex look. The top and sides of the panel show how the map was stretched, which worked because it can't be seen in the final, rendered images. The lines were made wider and deeper than they should be because the machine is seen from a distant point of view in the final render-

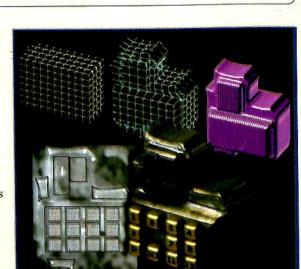


FIGURE 8. The control panel of the candy vending machine. Notice how a simple box was manipulated to obtain a final, smooth model.

ings. This same consideration was given to the letters and numbers on the machine: in real life the numbers would be proportionally smaller.

BEYOND INFINITY On the right side of the Rotunda, just opposite the Vending Room, lays the entrance to the Infinite Corridor. The Infinite Corridor is a magical hallway that changes from infinite to finite, depending on how the player approaches it. This is part of another puzzle; when entered in its infinite state, the player can never reach the end, therefore, it must be entered when it's in its finite state. When finite, the corridor is short and leads to a small

locker area. From this area, the player can go to other corridors or take the tunnel to the Spell Press Lab. Figure 9 shows the corridor as finite.

The Infinite Corridor was constructed using a modular system; one segment of the corridor was built and multiplied several times (similar to the technique applied to the Rotunda). Some elements protrude into the hallway space, such as the arches and the lamps with banners; others, such as the alcove containing the frame, recede in the space. This effectively breaks the natural monotony of a hallway, making the space a more interesting experience.

The lighting plays an important role in the Infinite Corridor. The floor was illuminated with blue spots with projector images, and the ceiling and walls were given yellow light. I wanted to follow the same palette as the Rotunda, while making the hallway appear more golden. The yellow light also brings out the richness of the materials on the walls and ceiling. However, should I have applied the yellow light to the floor, it would have made the hallway look like a claustrophobic tunnel. The less sickly, calm, bluish floor guides the player's eye smoothly to the end of the Corridor.

Some of the architectural elements created for the Rotunda are also found in the Infinite Corridor-they are not exactly repeated but are used in the same style. The decorative golden shield mimics the bulletin board and the vending machine; the jewels and lamp imitate the ornate columns in the Rotunda. Even the columns are found here as well, but are shrunken slightly. Because the environment is so narrow, the camera view point did not allow for tall elements.

To enrich the corridor visually, I added details such as the texturing on the picture frame. These objects have simple geometry with careful texture work applied to them. Some of the textures were hand-painted, and others were chosen from stock texture collections. When using art from CD-ROM collections, I manipulate the images so they are not easily identifiable as stock art. By mixing ornate textures with other all-purpose, dirt images, and by adding some color and metallic effects, the results are very different from the original image.

As for the lockers, I wanted to avoid creating the predictable rectangular



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#### ARCHITECTURE WITH A TWIST



FIGURE 9. The Infinite Corridor in its finite state, showing the door at the end.

shape found in traditional. school lockers. Instead, I chose an arched shape with ornate finishing materials to continue with the magical look and feel of the game. Figure 10 shows a partial panorama of the Student Lockers area, along with the texture maps used for the locker doors and front panel. When the all-purpose gray texture map was combined with a metallic material, the ornament faded into the scene, giving the area a unified look.

IN THE LAB When the player finally passes through

the Student Lockers area, the landscape changes dramatically. No longer in the underground cave, the player is standing on a small platform on the edge of an enormous chasm. Straight across the chasm is the Spell Press Lab. At first, it appears as if the only way to cross the chasm is a small rickety suspension bridge, but if the player solves the puzzle for this area, the first bridge is replaced with a beautiful golden bridge. The first bridge, shown in the partial panorama in Figure 11, looks decrepit and unstable. To make the contrast with the new, golden bridge even stronger, the old bridge is almost the same bluegray color as the chasm.

To create the geometry for the chasm, I used a displacement mapping tech-



FIGURE 10. The Student Lockers area, along with some of the textures used.

nique (similar to the one described in creating the underground cave). However, the initial geometry for the chasm was vertical. The variations on the black and white images used for the displacement map were made only slightly so as not to compete with the acute angles of the stalagmites and stalactites in the interior cave. I also manipulated some vertices manually to give the chasm a more random, organic look. To create the chasm walls, I created two different walls rather than mirroring the models and manipulating them afterwards. It took a little longer, but it guaranteed that each side of the chasm had a unique look.

The chasm disappears into a fog, which was convenient because the geometry was starting to become too long and awkward to be manipulated in the modeling window. To control the fog, I adjusted the camera ranges so the fog would start at the middle of the chasm and become thicker as the geometry for the chasm ends. I also fogged the background to prevent the chasm's end from showing through.

The golden bridge uses some of the elements also found in the rest of Gue Tech but contrasts dramatically with the blue-gray of the chasm environment. To achieve this effect, I used golden materials and experimented with the lighting controls. The entire chasm is lit by blue-gray lights from the right side. The golden bridge is excluded from the blue lights and is lit by two yellow lights, positioned more or less on top of it. Of course, these two yellow lights exclude the rest of the chasm as well, or else the entire blue chasm would be flooded by

yellow light, producing a green tint. This lighting effect can be seen in Figure 12, which shows a side view of the bridge.

Also interesting is the texture work on the bridge: The ornament below the handrails was not actually cut out, instead I used an opacity map. The results are acceptable only because the whole panel is almost out of sight, shielded by the shadows of the handrail. Had it been on the top of the handrail, like the jewels, the lack of and the statements.

thickness would be noticeable.

Once the bridge is crossed, the player is located inside another cave, which is the famous Spell Press Lab. This room contains magical machines that allow the player to create and fix magical spells. The walls are lined with lab tables and odd-looking gadgets. The focus of the room is the Spell Checker, a whimsical machine that does the final editing and creating of spells.

As you may notice in Figure 13, the palette in the Spell Press Lab differs from the rest of Gue Tech. The gold has given place to a rust brown color, and the machines are made of mahogany wood. The faded blue is not as prominent as in the other areas. Activision wanted this room to be different from the others, but



FIGURE 11. Partial panorama showing the platform and first bridge.

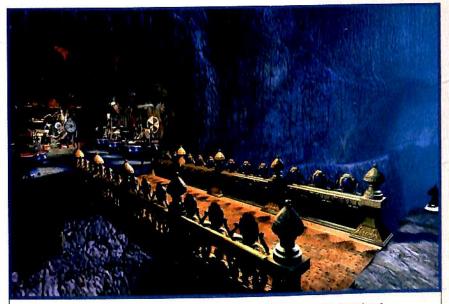


FIGURE 12. The golden bridge, which appears when a puzzle is solved..



FIGURE 13. Partial panorama of The Spell Press Lab.

with a design style that mimics the rest of the game. Creating the Lab was a special challenge because most of the machines did not have illustrations. Therefore, I had to design machines that looked "magical and weird," and worked. The machines were all animated and had to perform a variety of functions. Figure 14 shows close-ups of some of the machines, which resemble common household appliances, such as toasters, phones, and heaters. This was deliberate—we wanted them to look almost rec-

ognizable, but unusual and funky at the same time. Some of the elements such as gears and coils were repeated, but each machine was designed and created from scratch, and performed a unique role in the game-play.

**GAME OVER** To be given the opportunity to participate on this project, as well as on *Zork Nemesis*, has been invaluable for me. I had a chance to exercise what I preach: That in order to create quality 3D art, it is not only neces-



FIGURE 14. Three magical machines in the Spell Press Lab.

sary to have technical computer skills, but more importantly, to have artistic knowledge and a strong sense of design. Color choices and form design are still skills exclusive to the designer, and for now, no machine can replace that.

In the past, we have seen a flood of pre-rendered games that originally created a rich opportunity for architects and interior designers to diversify their skills. Even now, with pre-rendered adventure games giving place to low-count-polygon, real-time games, the skills necessary to create these virtual environments is similar to those required for a traditional architect. Real and virtual architecture have the same purpose: Designing space and making the experience of wandering through it unforgettable.

Would you like to see more coverage of this subject? Circle Reader Service No. 169

Eni Oken is a freelance 3D artist based in Los Angeles. Originally from Brazil, Eni has 10 years of experience with computer graphics. To see more, go to Eni's web site at www.oken3d.com.



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So much to store, so many solutions. See how storage technology is changing the way we transfer.

n the dark ages of the early

age were considered to be the ground-

breaking 2.5 and 5MB hard disks that

Tandy (of Radio Shack fame). It was a

were being offered by companies such as

1980s, a fully loaded personal

computer consisted of a green



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monochromatic monitor, a keyboard, an external 8-inch floppy drive and a whopping 4K of RAM. All this and no hard drive? Yes. But a hard disk wasn't mandatorystorage needs rarely exceeded the 8-inch revolutionary time, when cutting-edge floppy disks that accompanied the 8technology could be obtained for a premium price-\$2,000 and more. At that time, massive amounts of stor-

However, compare those figures to current storage options and you'll be amazed. A 4GB (4,000MB) hard disk, for example, can be purchased for less than \$250. As the costs of all computer parts continue to come down in price and increase in capacity and/or performance, you will have more choices than ever before. So how do you know which technology is the best one for you? Read on for more details.

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So much to store, so many solutions. See how

storage technology is changing the way we transfer. archive, and communicate in multiple dimensions.

Chris Tome

n the dark ages of the early 1980s, a fully loaded personal computer consisted of a green monochromatic monitor, a keyboard, an external 8-inch floppy drive and a whopping 4K of RAM. All this and no hard drive? Yes. But a hard disk wasn't mandatorystorage needs rarely exceeded the 8-inch floppy disks that accompanied the 8inch drives.

At that time, massive amounts of storage were considered to be the groundbreaking 2.5 and 5MB hard disks that were being offered by companies such as Tandy (of Radio Shack fame). It was a

revolutionary time, when cutting-edge technology could be obtained for a premium price-\$2,000 and more.

However, compare those figures to current storage options and you'll be amazed. A 4GB (4,000MB) hard disk, for example, can be purchased for less than \$250. As the costs of all computer parts continue to come down in price and increase in capacity and/or performance, you will have more choices than ever before. So how do you know which technology is the best one for you? Read on for more details.



#### STORAGE SOLUTIONS

HARD DISK 101 Unlike its cousin, the floppy disk (which really was floppy until the hard plastic 3.5-inch version came along), a hard disk actually contains a hard metal platter (or platters) on which a magnetic arm passes over as the disk spins, and reads or writes data from or to the disk by using magnetic currents.

In the case of removable storage products like those from Iomega or SyQuest, the disk itself is encased in a hard plastic shell, which can be removed from the read/write mechanism (the main drive) for portability. These devices are also known as "hard floppies," which provide the speed and capacity of a hard disk with the portability and security of a floppy. A truly portable solution that you can take with

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you, lock in a safe, or keep as a back up of important design files.

While very different from a hard disk or removable drive, a CD-ROM burner is effectively the same principle, substituting the magnetic head(s) for a laser and a plastic disc for the hard disk platter. Because CD-ROMs are more durable than hard disks, which are extremely sensitive to dust and scratches, a permanent external case for the disc is not required.

Most people are familiar with CD-ROM (read only memory) technology, but what makes CD-RW (write many, read many) different than CD-R (writable)? With a regular CD-ROM burner, files may be added to a CD-R disk in increments until the disk is full, but data may not be deleted later. CD-

RW drives on the other hand, use a special type of CD, which allows you to add, delete, re-write, and append data to the disk at any time. Using pre-mastering software that is either included with the drive or sold separately, users can save and delete files just as they would on a regular hard disk, making the technology much more appealing than CD-R drives. CD-RW drives can also read and write regular CD-R disks. CD-RW is useful for 3D designers who are revising projects and sending them to clients for approval during the various stages. The biggest drawback to CD-RW is the price of the disks. While CD-R discs can be found for as little as \$2 in quantities of 10 or more, CD-RW disks can cost upwards of \$25.

#### GEEK SPEAK

SCS Small Computer Systems Interface. Now in its third incamation (sometimes referred to as Ultra2 Wide SCSI), SCSI is the *de facto* choice for any users demanding high-performance, large-capacity data solutions. Previous versions of SCSI could handle up to seven devices daisy-chained together, and current SCSI-3 interfaces can handle up to 32 devices with a single controller and support data transfer of up to 40MB/sec.

Integrated Drive Electronics. A hard disk drive interface in which the electronics that are needed to run the disk drive are part of the disk drive, not the disk controller, hence the term Integrated. With IDE, a maximum of two drives can be chained together and driven by one controller. IDE has a maximum throughput of 1 to 3MB/sec. IDE is a very old technology, and most new computers ship with EIDE on the consumer side, and SCSI for workstations.

EIDE Enhanced Integrated
Drive Electronics. Also called Fast
IDE and ATA-2. The successor to

IDE, the Enhanced IDE spec allows up to four drives on one controller, and supports tape drives, CD-ROMs, and more. Data transfer rates are also substantially faster than IDE, with a maximum transfer rate of up to 16MB/sec.

CD-ROM Compact Disc Read Only Memory, Based on the same technology used in audio CDs, CD-ROM (also known in engineering circles as Yellow Book) technology uses a 780nm laser to read encoded pits, or grooves, on the underneath surface of the disk. Using Constant Linear Velocity (CLV), a CD-ROM drive spins faster when reading near the center of the disk and slower when reading near the edge. This increases capacity, but also affects seek times, making CD-ROM slower than hard disks.

RAID Redundant Array of Inexpensive Disks. A RAID drive is actually a series of independent disks, which can be "striped" to act like one large disk. This allows for much faster read/write access to your data, and may also include a

mirror drive, which will automatically take over if one drive fails.

RAID drives are typically found attached to servers and are used by multiple people on the network, but they are also very popular in the video editing field, where high speeds and lots of storage space are critical to digital video editing and 3D animators as well.

RPM Revolutions Per Minute. Similar to the way a car works, the speed with which a drive reads and writes data is determined mainly by how fast the disks can spin without overheating. AV quality drives are rated at 7,200 rpm or higher.

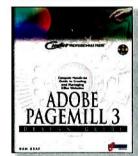
MTBF Mean Time Between Failure. This term simply means how many hours a drive is rated to run in Power On Hours (POH) before it could fail, or should be replaced in mission critical applications. Standard consumer level drives have a MTBF of around 250,000 hours, and professional drives like the Quantum and the Western Digital reviewed in this article, have a MTBF of 1,000,000 hours.



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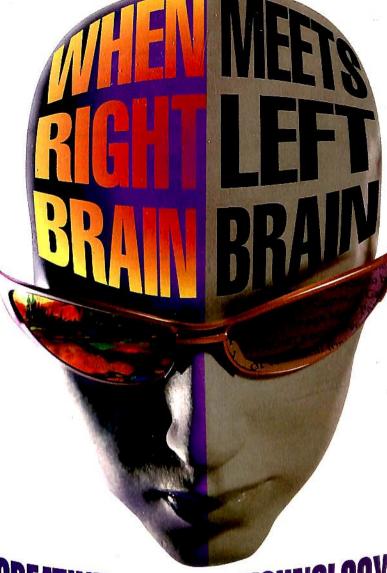


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#### STORAGE SOLUTIONS

#### SO MANY CHOICES, SO LITTLE TIME Many companies will

spec their drive speeds using the burst rate of the drive (analogous to a sprinter's start from the block). However,

a more telling example of a drive's performance is the sustained transfer rate or how fast disk I/O (input/output) occurs over a long period of time (like longdistance running). Therefore,



SyQuest SyJet

during the course of this article, we will focus on sustained transfer rates rather than burst rates.

For all of the SCSI devices tested, the Adaptec 2940 SCSI controller, which is one of the most reliable controllers on the market, was used. Disk speed tests were performed using Adaptec's SCSI Bench, which can test either sequential or random I/O. Sequential writes a file continuously to a certain portion of the disk, whereas a random writes data to wherever the heads happen to be at the time.

The Adaptec 2940/UW controller was used to test the Ultra SCSI drives. I used the drives with memory intensive applications such as Photoshop, After Effects, and 3D Studio MAX; I copied large video files to the drives and played them from the disk to measure playback performance.

SYQUEST SYJET Once the dominant leader in the removable storage marketplace with its SyQuest 44 and 88MB removable hard disk media, SyQuest has lost market share to other removable media companies such as lomega and its Zip and Jaz removable disk drives.

But with competition comes innovation. SyQuest has been aggressively marketing the SyJet, a new line of removable storage devices for Mac and PC that are fast and inexpensive. The SyJet is a 1.5GB disk drive that is available in four configurations: external PC parallel port drive, external PC/Mac SCSI, internal PC SCSII and internal PC EIDE. (We tested the external PC/MAC SCSI drive.)

SyQuest touts a data transfer rate of

around 6.9MB/sec for the SyJet. However, our test results show sustained transfer rates of approximately 4.3MB/sec, which is still very respectable for a removable media

device. The device includes an A/V (audio/visual) mode, which speeds up disk I/O for recording and playback of A/V files, however SyQuest recommends not using it for regular data trans-



SyQuest SparQ

fers because it's not as stable. As for the aesthetic design of the drive, the drive door, which is designed to keep dust and dirt out of the drive, hinders productivity slightly. Because the Sylet disks must be pushed down into the drive to be properly seated, the first time I inserted a cartridge it wasn't seated properly, wouldn't eject using the eject button, and I had to do it manually

Overall, the SyJet is a quality drive at a respectable price. Media for the drive costs about \$80 per cartridge, which comes down to about 20¢ per megabyte—a reasonable price. The drive is fast enough to run applications from, or can be used to save rendered frames, transfer data between locations, or backup your system easily. While the drive is not as widespread as the Iomega Jaz drive, it is an excellent unit and would be worth a look for the budget-conscious user with serious storage needs.

# **SYQUEST SPARQ** The SparQ from SyQuest is a parallel port disk drive with 1GB of storage per disk. Although an internal EIDE model is available, we

tested the parallel port external version.

This drive is well built, and the 1GB cartridges are great for backing up your

system or transferring large amounts of data between systems. It's not fast, but it is inexpensive—a three-pack of cartridges is only \$99. This drive would be good for someone who needs the capacity of a Jaz drive, but has the budget for a tape backup drive.

In file transfer tests, the rate was approximately 300k/sec, which is respectable for a parallel port drive. While this drive was not designed to run applications, it is a good solution for archiving and retrieving 3D work. The SparQ is priced at \$199, making it an affordable and more reliable storage solution than tapes for backing up and archiving your models and animations.

**IOMEGA ZIPPLUS** Many companies have tried over the years to offer replacements to the 3.5-inch floppy drive, but the floppy drive still remains. However, Iomega made significant progress in taking removable media to the next level with the release of its Zip drive.

In the 3D design industry, the Zip drive is universal. With millions of Zip drives in existence and many computer vendors including them as standard components in their workstations, it looks as if the Zip drive is here to stay.

The Zip*Plus* drive is the latest improvement on the original Zip drive, which is available in either SCSI or parallel port versions. Now, with the Zip*Plus*, you can use SCSI or parallel, and the drive automatically detects it.

The installation of the Zip*Plus* is very simple. However I did experience some difficulty getting the drive to work in parallel port mode under Windows NT 4.0. In addition, the only SCSI adapter provided was MAC; the adapter cable for the PC SCSI port was not included

The power supply has been dramatically scaled down to take up less space. The software bundled with the Zip drive includes Adobe PhotoDeluxe (an image editing program), DataViz Web Buddy (an Internet data organizer), Iomega RecordIt (for recording audio files to your Zip drive), and more utilities.

The Zip Tools software makes it easy to mount a Zip disk, and the software has backup and restore features that are easy to use. Zip disks cost an average of \$10 each, which works out to about 10¢ per megabyte. They are very sturdy—I have dropped them, spilled things on



Iomega ZipPlus

tests were performed by a professional—do not attempt them at home).

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In SCSI mode, the transfer rates are an average of 1MB/sec, which is not fast enough for running applications, but the Zip*Plus* is ideal as a general purpose storage device. Any 3D designer who has to move models from PC to Mac will want to consider the new Zip*Plus* It's a worthwhile investment.

#### **IMATION SUPERDISK Some-**

times it's the little things that matter the most. With the Imation SuperDisk, the first thing I noticed is that it lacks an indicator light to tell you if the drive is on. As I discovered, when it's plugged in, it's on.

The SuperDisk is designed to replace the floppy drive—it reads and writes both regular 1.44MB floppies as well as the 120MB SuperDisks. The drive connects to your PC through the parallel port and shows up as the B: drive in the "My Computer" win-

dow. The drive, however, was not built

for speed. When put to the test, it sustained a transfer rate of around 250k/sec.

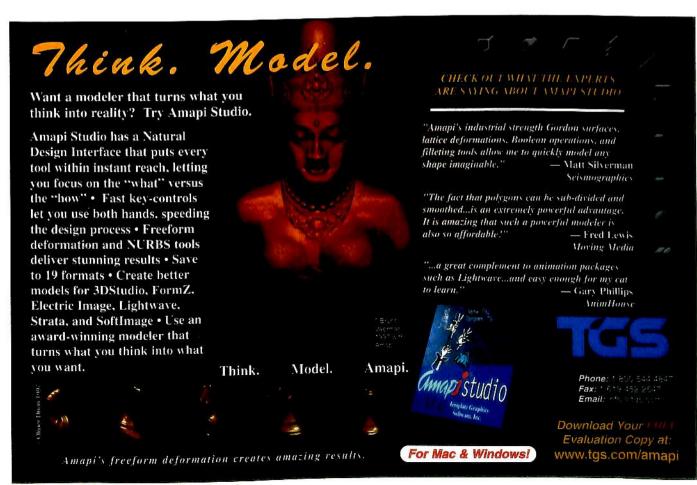
The SuperDisk media is \$49.95 for a package of three and the drive is priced at \$199. If your goal is to find an inexpensive storage solution, and lower transfer rates are not a concern, then the SuperDisk may be the right choice for you. Regular floppies also per-

form better in the drive so if you still transfer files on 1.44MB floppies, it's an added benefit.

The SuperDisk is definitely a unique offering, but its \$199 price tag puts it in direct competition with the Iomega Zip-Plus drive. While the SuperDisk disks can hold 20MB more than the Zip disks, it's transfer rates are considerably slower than those of the Zip. In my opinion, if the SuperDisk drives were priced even



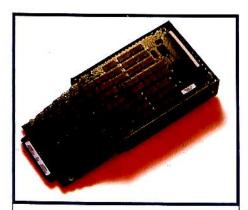
Imation SuperDisk



\$50 lower and the media were less costly, this would be the ideal replacement for the floppy drive, filling a nice niche between the floppy disk and media such as the Zip disk.

#### **QUANTUM RU3013 SOLID** STATE DRIVE Of all the drives

tested for this article, the Quantum drive was the most interesting by far. Why? The drive has no disks, no heads, and an access time of 60 nanoseconds. Yes, it's a RAM drive!



Quantum RU3013 Solid State

While the model we tested was only 135MB, Quantum has solid state drives with capacities of up to 1.6GB. These drives are great for applications requiring near-instantaneous I/O performance such as databases, sustained video streaming, and the World Wide Web.

As I prepared to put the Quantum drive through its paces, I discovered that it doesn't ship with the adaptor that is required to use the drive. According to Quantum, if you purchase the drive, you must also purchase an adaptor-a definite drawback given the higher cost of this solution, which is approximately five times the price of its disk-based cousins.

In the SCSIBench tests, the drive sustained transfer rates of 18MB/sec, but I am sure it could be faster with server configurations that have a better controller and bus speed than a standard PC. Using it as the main scratch disk for Adobe Photoshop was wonderful—I used a 90MB file as part of the test, and it was just like working in RAM.

Expect to see solid state drives become more affordable in the future. Maybe one day RAM prices will be as cheap as hard disk space is today, and

CY-10XP RAID (call for pricing) Cybernetics Inc. **111 Cybernetics Way** Yorktown, VA 23693 tel: 757-833-9990 www.cybernetics.com **READER SERVICE NO. 170** 

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> ZipPlus (\$199) Iomega Corp. 1821 West Iomega Way Roy, UT 84067 tel: 801-778-1000 www.iomega.com READER SERVICE NO. 172

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WDE9100AV (call for pricing) Western Digital 8105 Irvine Center Dr. Irvine, CA 92618 tel: 714-932-5000 www.wdc.com READER SERVICE NO. 176

CRW4260tx CD-RW (\$549) Yamaha Systems Technology 100 Century City Ct. San Jose, CA 95112 tel: 408-467-2300 www.yamahayst.com READER SERVICE NO. 177



Western Digital Enterprise WDE9100AV

we will all use these drives for almost instant access to our data.

#### WESTERN DIGITAL **ENTERPRISE WDE9100AV** This

Western Digital drive is hot-literally. With an average seek time of 7.5ms and spinning at 7200 rpm, this drive runs fast and generates a lot of heat doing it. When I was finished testing the drive, I almost burned my hands trying to remove it. In order to make sure your drive lasts a long time, make sure to install it in a bay where there is good ventilation, and close to a fan if possible. Some people have installed extra cooling fans in their boxes in order to make sure the computers components receive enough air. The drive is a 3.5 inch and fits easily into any open bay in your PC.

One of the things you have to keep in mind under NT is that the boot disk can be no larger then 4GB, so if you are installing this as a boot disk under Windows NT, any hard disk drive larger than 8.4GB must have at least two partitions. I used OnTracks' Disk Manager for Windows software, which is an excellent utility for managing, formatting, and partitioning large hard disks.

The drive was tested by loading video files, using Photoshop, and doing large file transfers. It is an excellent performer, and was able to handle every task necessary. The sustained transfer rate under Adaptec's SCSIBench was a very respectable 13.1MB/sec.

QUANTUM VIKING II A direct competitor to the Western Digital Enterprise drive, the Viking II has specs that are almost identical to the 9GB Enterprise. It, too, runs very hot, and the more ventilation and cool air the drive receives, the better.

The Viking performed well with a sustained rate of 13.1MB/sec. As with the Western Digital, the drive must be partitioned, and I used the OnTrack Disk Manager that I downloaded from the Quantum web site (www.quantum.com). The average seek time is 7.5ms, and the drive spins at 7,200 rpm. If it wasn't for the stickers identifying the Quantum and Western drives, it would be impossible to tell them apart.

Drives such as the Western Digital WDE9100AV and th Quantum Viking II are great for 3D designers who need high speed disk access for playback of animations, using the disk as a supplement to their RAM for rendering, or other tasks that require high speed I/O.

YAMAHA CRW4260TX

CD-RW The Yamaha CD Rewritable drive is a 6X (or 6-speed) CD-ROM reader, as well as a 4X CD-R writer, and a 2X CD-ReWriter. It comes bundled with Adaptec's Easy CD Creator, which makes it simple to burn files onto a CD-R or CD-RW. The Yamaha handles data CDs as well as audio CDs effortlessly. The unit is a SCSI-2 drive, and the only glitch I encountered was while trying to copy an audio CD-my SCSI-1 CD-ROM drive wasn't fast enough to keep up with

The Yamaha is a great drive to use for backing up files, burning your demo reel, or many other purposes. While CD-RW disks are pretty expensive (\$25 or more), CD-R disks can be purchased for as little as \$2 each, making them a very inexpensive storage medium. This is a good solution for a 3D designer that doesn't have access to a video system, but wants to put their demo reel on CD for distribution.

CYBERNETICS CY-10XP

RAID RAID stands for redundant array of inexpensive disks, and the Cybernetics RAID is a nice example of an entrylevel RAID system. Housed in an external case that is approximately 18 inches deep and 8 inches wide, the CY-10XP is a solid performer, with a sustained transfer rate of 18MB/sec, great for video work or playing back 3D animation in

real time. The only drawback to the drive is that it has a great deal of fan noise.

I was really able to put the unit through its paces on a project in which I



Quantum Viking II

mixed 3D and digital video ("Mixing 3D and DV," April 1998, p.38) and was very impressed with the unit. I pushed over 5GB of video and animation through the drive, and it never faltered. For those who need the ultimate in storage and

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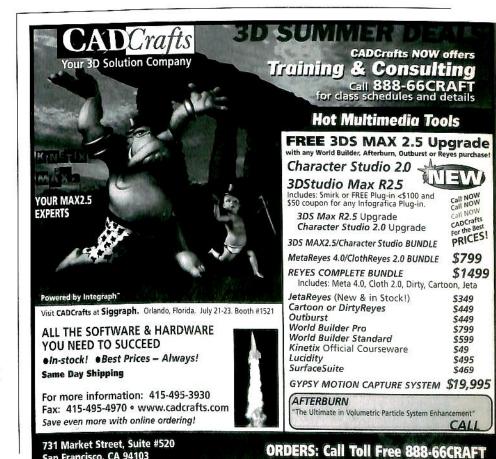
speed, a RAID drive is the way to go, and Cybernetics is a great choice.

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Chris Tome is 3D Design's technical editor. Contact him at ctome@mfi.com.





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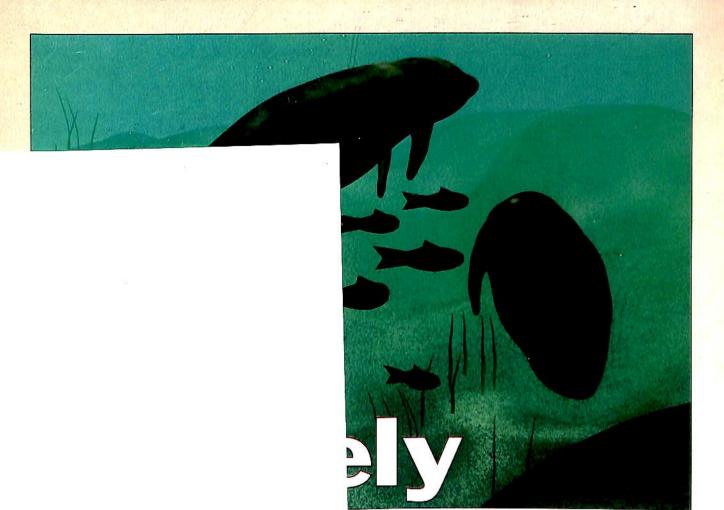
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ideal way to give 3D models an organic look and feel. See how RAYflect Blubble, a new plug-in for Ray Dream Studio, opens up new avenues for creating interesting 3D characters with plenty of shape.

by Douglas A. Sahlin

\_\_\_\_rfaces

veryone wants to create fluid shapes and smooth surfaces without dedicating a lifetime to accomplishing the feat. NURBS (non-uniform rational B-splines) offer organic modeling at the high-end of the spectrum, but for many designers and animators, NURBS are not a feasible, or practical, solution. As an alternative, metaball modeling continues to gain in popularity as more 3D modelers adopt the technique.

Metaball modelers come in many flavors-from freeware programs on the Internet to plug-in solutions for established 3D modeling and animation programs. One of the more recent entries into the metaball modeling market is RAYflect Blubble plug-in for MetaCreations' Ray Dream Studio 5.

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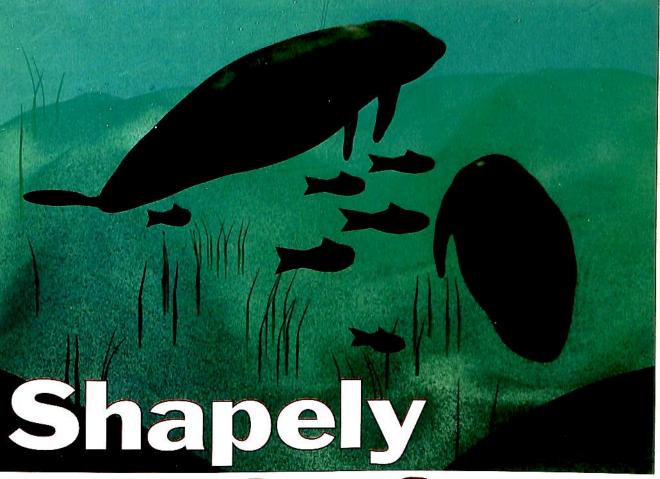








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ideal way to give 3D models an organic look and feel. See how RAYflect Blubble, a new plug-in for Ray Dream Studio, opens up new avenues for creating interesting 3D characters with plenty of shape.

by Douglas A. Sahlin

# Metaballs are an ideal way to give SUFFACES

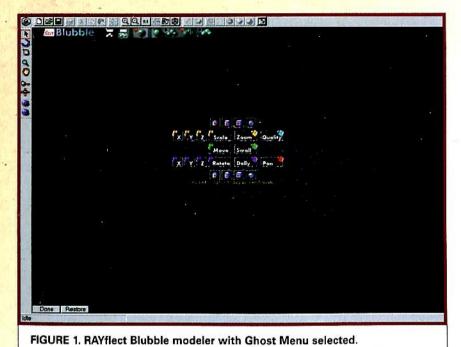
veryone wants to create fluid shapes and smooth surfaces without dedicating a lifetime to accomplishing the feat. NURBS (non-uniform rational B-splines) offer organic modeling at the high-end of the spectrum, but for many designers and animators, NURBS are not a feasible, or practical, solution. As an alternative, metaball modeling continues to gain in popularity as more 3D modelers adopt the technique.

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#### RAYFLECT BLUBBLE: WHAT IT IS, WHAT IT DOES RAYflect

Blubble is a metaball modeler designed to create smooth, organic shapes. Working with RAYflect Blubble is like modeling with virtual clay. Simply put, the



building blocks of a RAYflect Blubble model, which are called Blob Elements. are blended together to create new shapes from the four available pre-sets: spheres, cubes, cylinders, and cushions. These shapes can have positive or negative forces of attraction. If metaball modeling is new to you, the concept is fairly simple—positive elements attract each other, and negative elements repel each other. Negative elements effectively push away the skin surface of any surrounding elements; the degree of blending is determined by the physical proximity of the interacting elements. With RAYflect Blubble, blending two positive primitives together is similar to lumping two pieces of clay together; and adding a negative primitive to a positive is simi-

When the RAYflect Blubble extension is added to Ray Dream Studio 5, the RAYflect Blubble tool is added to Ray Dream's toolbar. Creating a RAYflect Blubble model is simple—drag the tool into the perspective window, timeline, or hierarchy to launch the RAYflect Blubble modeling window. Once inside the RAYflect Blubble modeling window, right-click your mouse to open RAYflect's innovative Ghost Menu which includes tools to create, size, move, or rotate a Blob Element (Figure 1.) The Ghost Menu was designed to be an extension of the artist's mind. Gone are the days of navigating through pull-

lar to tearing off a piece of clay.

down menus. The artist's tools can be found right where they're neededbelow the cursor. However, if you prefer, conventional menus are still available.

Another of RAYflect Blubble's strengths is that you can view your model from any vantage point. A right-click of the mouse while holding down the alt/option key introduces the View Presets Ghost Menu, making it possible to edit your project from any view (Figure 2).

To animate with RAYflect Blubble. simply add the number of keyframes needed to animate the model to the RAYflect Blubble primitive's timeline. Select the keyframe where the animation change occurs, jump into the RAYflect Blubble modeler, and make the desired changes. Leave the RAYflect Blubble modeling window to effect the change. Repeat this process on each additional keyframe to complete the animation.

#### **BLUBBLE IS AS BLUBBLE**

**DOES** To show how effective the RAYflect Blubble modeling tool can be for creating organic objects, we've chosen the perfect object—a manatee. Its bulky, amorphous shape is the perfect subject for putting the RAYflect Blubble metaball modeler through its paces.

· Launch Ray Dream Studio 5. Select the

To model the manatee:

RAYflect Blubble tool from the toolbar and drag it into the perspective window, timeline, or hierarchy. This launches the modeling window.

· Hold down the alt/option key and right-click the mouse to activate the Preset Views Ghost Menu. Select the front view and right-click to activate the standard Ghost Menu.

· Select the positive sphere element. After the Ghost Menu closes, left-click and drag the mouse to create one.

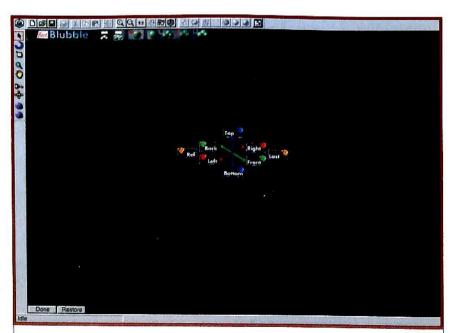
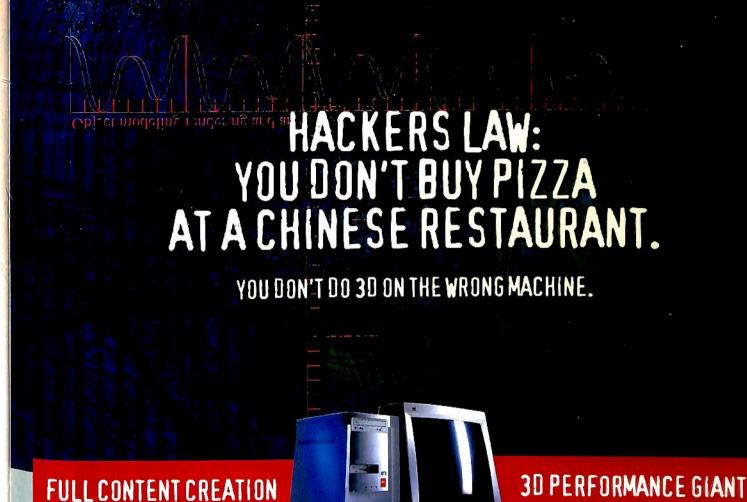


FIGURE 2. RAYflect Blubble modeler with View Presets Ghost Menu selected.









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FIGURE 3. A positive sphere element flattened with the Scale Z tool.

- With the sphere still selected, rightclick to re-activate the Ghost Menu and select the Scale Z tool.
- After the Ghost Menu closes, you have a cursor with an arrow and a Z. Drag left with this tool until you turn the sphere into a pancake-type shape (Figure 3). This will be the manatee's tail.
- Right-click the mouse to activate the Ghost Menu. Select a positive cushion shape. When the Ghost Menu closes, drag the mouse to create it.
- With the cushion still selected, activate the Ghost Menu and select the Scale Z tool. Flatten the cushion along the Zaxis until it's as tall as the sphere you just created.
- Alt/option and right-click to activate the Preset Views Ghost Menu. Select the top view. Re-activate the standard Ghost Menu and re-scale the cushion's X-axis.
- Drag the flattened cushion into the flattened sphere and watch the two shapes to form the manatee's tail (Figure 4).

A MODEL BODY The manatee's body consists of several positive spheres, flattened, rotated, and intersected with each other (Figure 5). The manatee's flippers are constructed of elongated spheres. Notice these spheres are a different color from the rest of the model. RAYflect Blubble allows you to assign any of nine preset colors to a Blob Element, with which you can create and select elements by color—a handy feature when editing a complex model.

When working in the RAYflect Blubble modeling window, you have multiple

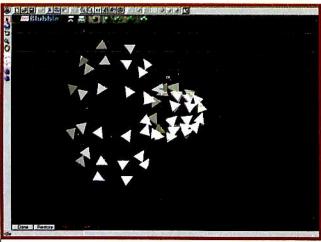


FIGURE 4. A flattened positive sphere element intersected with a flattened positive pillow element.

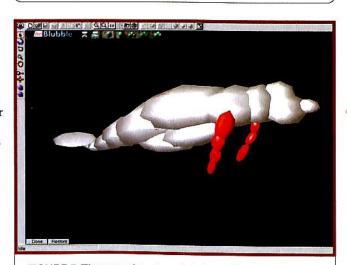


FIGURE 5. The completed model viewed in the Non-Interactive Primitives mode.

viewing options. Your model can be viewed in wireframe format or shaded format. Each format can be pre-viewed as either particles, primitives, or continuous mesh. Preview your RAYflect Blubble model in the interactive particle preview mode (Figure 6) while modeling and switch to the continuous mesh preview mode to get an idea of what the finished model looks like (Figure 7).

To finish the model of the manatee, continue adding, rotating, and aligning spheres until you have the shape you desire. Click Done to return the finished model to the Ray Dream Studio Perspective Window. If the shape isn't as desired, double click the object to return to the RAYflect Blubble modeling window.

JUST ADD WATER After you're satisfied with the manatee model, add other elements to create a finished scene. The scene accompanying this review was created by duplicating and repositioning the original manatee. The small fish were modeled with the Ray Dream Studio Mesh Form Modeler. The underwater terrain was created with RAYflect's Four Elements extension. A

single blade of grass was modeled in the Ray Dream Free Form Modeler, duplicated, repositioned, and grouped. The group of grass blades was duplicated several times and randomly positioned about the undersea terrain.

The manatees were shaded by using the Cellular Function to mix two brown tints. The Cellular Function was also applied in the bump channel. The Highlight and Shininess Channels were reduced for the desired effect. The scene was lit by a yellow overhead spot light aimed at the terrain. A gel was applied to this light to make it look as if the sun was shining through rippling water. The second light source was a weak front Distance Light aimed at the manatees.

The final image was rendered against a dark blue background. Ambient light

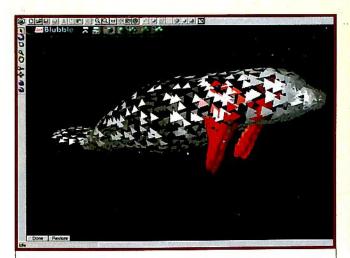


FIGURE 6. The completed model viewed in the interactive particles mode.

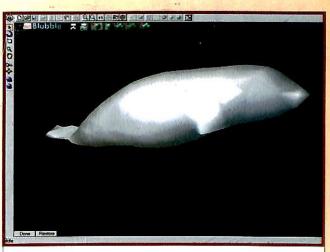


FIGURE 7. The completed model viewed in the continuous mesh mode.

was turned off and a blue-green fog was added to the atmosphere setting to give the scene an underwater feel (Figure 8).

#### FEATURES AND FOIBLES For

a 3D designer interested in modeling organic objects, RAYflect Blubble is a powerful addition to Ray Dream Studio 5 and seamlessly interfaces with the main program. The Ghost Menus are a wonderful innovation and the modeler allows you to specify the Surface Threshold between Blob Elements. The default Surface Threshold is 50%. Raising the

Surface Threshold creates larger Blob Elements and higher interaction. There's also an option to increase Surface Fidelity, which increases the polygon count of the finished model. A word of caution here: Higher surface fidelity increases redraw time and also requires more memory to complete.

Noticeably missing from the RAYflect Blubble modeler is the ability to simultaneously activate all three planes. Having all planes active at once would make it much easier to align objects. However, RAYflect states that its intention was to provide a less cluttered interface when modeling a multiple-element object. Also, small Blob Elements are difficult to view in the Continuous Mesh Viewing mode. On more than one occasion, I had to exit the RAYflect Blubble Modeling window to see how my manatee model was progressing. The extension would benefit from the choice of more Blob Elements—cones and pyramids immediately come to mind. Complex multi-element models can be difficult to manipulate and resize on a slower machine with minimal amounts of RAM.

Overall, the extension is a welcome addition to Ray Dream Studio. A demo version of RAYflect Blubble can be downloaded directly from RAYflect's web site (www.rayflect.com). The demo functions fully with the exception of creating the finished model. If, after working with the demo, you decide you can't live without RAYflect Blubble, log onto the web site and purchase a serial number through the secure server.

RAYflect Blubble comes with a thorough manual and three tutorials, all written in the Adobe Acrobat format. RAYflect Blubble sells for \$129—a fair price for such a powerful extension.

Would you like to see more coverage of this subject? Circle Reader Service No. 179

Doug Sahlin is a writer, freelance graphic illustrator, and 3D designer living in Lakeland, FL. You can reach him via e-mail at das001@earthlink.net.

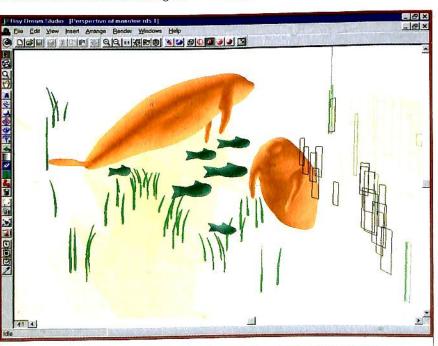


FIGURE 8. The completed scene prior to rendering, viewed in the Ray Dream Perspective Window.

## IN THE LAB

3D PRODUCTS PUT TO THE TEST

### 3D Architecture on a Budget



rice is no longer a barrier for designing projects in three dimensions. For \$2,000 or less, you can invest in a 3D design and modeling program that will help you increase the services you offer to your clients and still maintain your artistic freedom in the process.

If you've never considered making the move to 3D design, you may be surprised at just how easy it can be. Not only can you create photo-realistic models and presentations of future projects, you can also create databases of components and fixtures, and archive specifications and details to create your own database library for future projects. Once you make the switch from 2D to 3D, you'll be wondering how you managed to design without it.

#### The Vitals

What features are mandatory for 3D modeling? At the very least a 3D modeling program should include extrude, revolve, 3D rotation, movement and alignment commands, and Boolean operations. These six commands can produce most of the shapes you'll need when designing architectural projects. However, if you are designing a building or environment that has organic prop-

erties, you'll have to investigate other types of design methods, such as NURBS (non-rational B-splines) or metaballs. Each of the programs reviewed here has strengths and weaknesses that may or may not appeal to you. However, each program is conducive to architectural design.

The minimum system requirements for all these programs meet those of the platforms they run on (Windows 95 and Windows NT). Obviously, the more memory on your machine, the better your software will perform, so exceeding the minimum system requirements will increase performance. All the programs ship on CD-ROMs and offer thorough documentation, with detailed on-line help and task-based tutorials that can be accessed through context-sensitive help interfaces. Table 1 (p. 70) provides a detailed laundry list of features for the five programs reviewed in this article-3D Studio VIZ, Chief Architect, Concept-CAD, form . Z, and MiniCAD.

The programs were tested on a Windows 95 Pentium 166 laptop PC and a Windows NT 4.0 Pentium Pro 200 desktop PC with 32 and 128MB of RAM, respectively. Installation times were all extremely fast, taking less than 15 minutes per program to be up and running, even on the portable computer. While

the performance on the computer with 32MB of RAM was acceptable, I suggest a minimum of 64MB of RAM for large projects.

### 3D Studio VIZ

3D Studio VIZ (3DS VIZ) requires a 90MHz Pentium computer and at least 32MB of RAM for operation. The default installation takes up a hefty 144MB of hard disk drive (HDD) space, which includes a great many sample files and bitmap images.

3DS VIZ is a tailor-made version of its big brother program 3D Studio MAX, which was customized for the design visualization industry, including AEC. The features that were removed from 3DS MAX to create this program will be hardly missed by architects. 3DS VIZ is primarily a modeling, rendering and animation tool that is capable of importing and exporting 3DS, DWG, and DXF files. While it is not meant to be used for documenting designs, it can be by pairing it with AutoCAD LT.

All the modeling power available in 3D Studio MAX 1.2 is found in 3DS VIZ, in addition to preemptive 3D object snaps based on AutoCAD R14's AutoSnap feature. While 3DS VIZ doesn't offer the

power of NURBS in the new MAX 2.0, it does combine ease of use with engineering precision.

With 3DS VIZ, nothing is chiseled in stone. Through the Modify Command Panel, you can access the entire creation history of all the objects you create, which allows you to quickly create volume/massing, schematic studies early in the design phase. You can also make precision adjustments during the design development phase when clearances and minimum square footage areas become critical. Alternatively, you can back track through a

project using the program's unlimited UNDO levels. 3DS VIZ is a program that feels very forgiving. If you are unclear what effect a certain modifier might have on an object, it is easy to adjust different values until you achieve the result you're after.

A typical modeling session consists of the creation of walls, followed by the insertion of openings such as doors and windows, the creation of roof and floor surfaces, and finally inserting entourage items. You can import 2D floor plans from AutoCAD and then extrude the lines to quickly turn a 2D drawing into a 3D model. You can also combine boxes using Boolean operations to model walls with openings. Unfortunately, 3DS VIZ's 2D creation tools are a bit weak. Therefore, it is best to combine it with a 2D CAD program such as AutoCAD LT, which has object snaps and keyboard entry.

My favorite feature in VIZ is the ability to create section cuts that can be exported to any program that reads the DWG file format. This feature can save a great deal of time in the creation of sections for Construction Documents (CDs). Although its interactive, parametric door and window objects are great for architects, I feel the program is lacking in architecture-specific content and features such as automatic roof and wall creation tools. Those parametric objects, for example, would work much better if there were matching smart wall entities to go with them. Currently, you must

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The 3D Studio VIZ interface includes scrollable menus and other unique GUI enhancements.

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by Emmanuel Garcia and Teresa Woods de Garcia physically create the opening in the wall before you can correctly insert and render a door or window.

3DS VIZ can be combined with AutoCAD LT 97 for an affordable and fairly complete 2D/3D CAD/rendering solution that is well suited to the architectural studio.

#### **Chief Architect**

Chief Architect's default installation takes up about 21MB of HDD space—which includes 4MB of sample drawings—and

requires at least 8MB of RAM. It will run on a 486DX-33, but a 486DX-66 or Pentium processor is recommended. It does not provide tool tips, which would make the program easier to use, and its performance is rather slow, especially when switching from 2D to 3D views. Even when running the program on a P6-200, I found the refresh rate of several seconds or more to be distracting. This was the case even with relatively small, 400KB sample files in spite of using 3D accelerator cards, because the program recalculates all polygons when changing views.

A typical drawing session consists of selecting the wall tool, adding wall openings such as doors and windows. creating a roof and populating the scene with furniture and fixtures. All this is done while working on a 2D plan viewport. At any time, you can view your project in 3D by clicking on any of the 3D view icons or by accessing the 3D/Create View pull-down menu. I started using the program by exploring the Build pull-down menu to place walls, doors, windows, cabinets, furniture, and fixtures. The program is great for people accustomed to working in a 2D environment or with hand drawings. While the user works in 2D, the program is internally creating a 3D model that is only a click or two away.

Chief Architect is very easy to use as long as you stick to the predefined materials that are included with the ARCHITECTURAL 3D

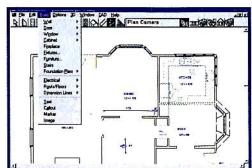
program, but when trying to create custom 3D shapes and a roof object, I encountered some difficulty. The wall creation tool has several great features and shortcuts. For example, you can left-click to locate the beginning of a wall and drag the mouse to specify its endpoint. If your mouse click is close to an existing wall, the new wall is automatically connected and the program "heals" or closes the resulting intersection. You can change the dimension of a wall by clicking it to expose "grips" or "handles" which can be dragged while the wall's dimension is shown and updated in real-time. Changing the type of wall is easy, too. Just double click on a wall, and a complete list of editable parameters shows up on the screen. This allows you to sketch floor plan layouts quickly, knowing that you can easily fine tune the dimensions later on.

Chief Architect lives up to its name. It is exclusively an AEC tool. Although 3D modeling is not its main thrust, it comes very close to being a"click of the button" 3D modeling program. You place objects on a 2D view screen and the program creates a 3D model and design documentation from the 2D layouts. Chief Architect is easy to learn and use. But unfortunately, you pay for the ease of use and automatic power with less flexibility. You can export the model as 2D and 3D DXF files, but can only import 2D DXF files.

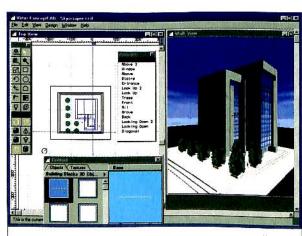
The program's strengths are in its automatic tools which are abundant in the design documentation area, such as the automatic plan check or the automatic electrical outlet placement option. The object library that comes with the program is reasonably complete. The 3D creation tools, which are highly automatic, satisfy the majority of conditions a builder or architect is likely to encounter in a traditional design practice. For example, the automatic roof generator can handle all conventional roof systems. The manual roof tools come to the rescue to create almost any buildable conventional roof. On the other hand, it is not the best solution for an architect or designer who needs to create fluid-shaped buildings or forms.

### ConceptCAD

The ConceptCAD program requires at least a 90MHz Pentium processor, 24MB of RAM and 25MB of available HDD space. The standard installation is well behaved and saves the application's data under the Program Files directory. In addition to a 3D design tool, the program also doubles as an animation/ walkthrough tool. It even includes a royalty-free player called Virtus Player that you can send to clients or consultants so they may freely explore the model you have created at their leisure. Concept-



Chief Architect modeling and rendering by Wayson Chong, AIA.



ConceptCAD's GUI is uncluttered and easy to use.

CAD's emphasis on real-time animation explains the hefty CPU requirements, which helps eliminate jerky playback of an animation or walkthrough.

The program's interface consists of pull-down menus; tool bars; and separate content (similar to a resources manager), design (a 2D viewport), and walk (3D viewport) windows. You can

place predefined objects in the scene, or extrude them from closed 2D shapes, in the design viewport. The geometry you create is then rendered immediately in the 3D walk window viewport, which can be used to navigate through the scene. One noteworthy feature, the walk window, provides the inclusion of collision detection, which keeps you from walking through walls. Therefore, you must walk through doors to gain access from one room to the next.

You can export ConceptCAD models to AutoCAD and 3D Studio. This means that the work you invest creating a preliminary 3D schematic model in the early phases of a project carries over to later phases when accuracy and design documentation become more important. The program can help you save time in the design and visualization phase by relying more on bitmaps and less on actual 3D geometry.

It is amazing what a picture of doors, windows, and walls with textures can do for a scene when they are applied to a simple box. This capability lessens the need to model everything in a scene. Boxes, for example, can have up to six different external and internal materials assigned to them, for a total of 12 different materials. This can be very useful for

architects wishing to create quick, photo-realistic renderings of simple, box-shaped buildings. All you have to do is take head-on pictures of the exterior and interior elevations and paste them to the corresponding side of a box or extruded polygon.

With ConceptCAD you can create preliminary presentations in a very quick manner. Most of the program operations are performed on more than 500 predefined, editable 3D

objects using a drag-and-drop interface that includes a nice library of basic 3D shapes, models, and texture maps. I think of these materials as basic building blocks that can be combined to create more complex, detailed objects. Models are constructed very quickly because you aren't creating objects from scratch. Instead, models are assembled from pre-



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defined components. It's easy to envision a designer, who has become familiar with the program, investing a couple of hours in the creation of a preliminary model and getting clients excited about the project. With presentation programs such as ConceptCAD, your clients will never have to look at blueprints again.

ConceptCAD solves many data sharing problems. Because it includes a royalty-free player, all your clients or consultants need is your project file to see a presentation. A 3D model does not rely on the viewer's technical ability to mentally convert a 2D view into a complex 3D object, and the ability to easily walk through the model makes this even easier. Clients can

tosh, Power PC, or the Alpha platform to the Wintel platform—all four versions are included in the program. Although form•Z requires only 16MB of RAM, 10MB of HDD space, and a 386 CPU, 24+MB and a 486+ is recommended. The program is capable of importing and exporting 3DS and DXF files and supports Windows System. Printer devices.

Installation of form•z is not very straight forward—it doesn't provide a standard setup.exe utility. Therefore, you have to manually choose the options you want installed.

If auto•des•sys sold the program's documentation separately, I would urge

| Description |

During the course of testing all the architecture programs, form•Z was the only program that crashed—while rendering the model shown above.

understand your designs with a smaller time commitment, and you can set your proposal apart from those submitted by your competition. Once you get the contract, all the preliminary schematic work that you have done does not go to waste. You can export the model you create it to any CAD program that supports DXF and DWG file formats so you can add design documentation notes and dimensions.

### form • Z

form•Z is a good program for anyone making the transition from the Macin-

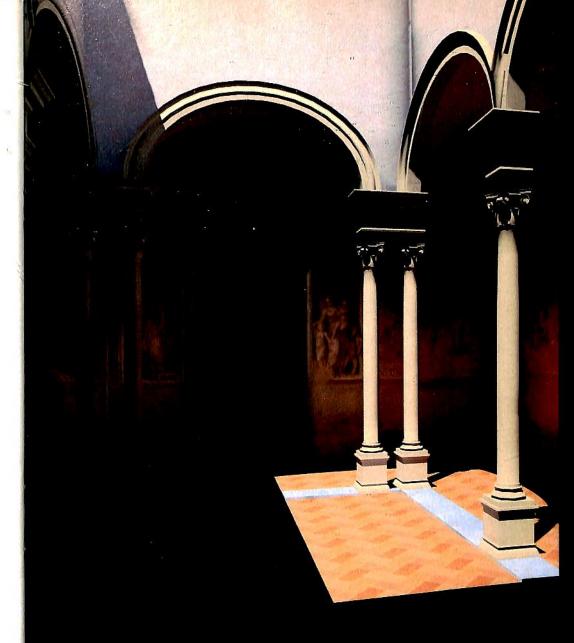
all 3D modeling beginners to buy it. It proposes a design approach that has an obvious 3D thrust. The program encourages the premise that you should first create a 3D model, and then extract the 2D design documentation from it. This makes perfect sense because we live in a 3D world where arcs, lines, and circles don't really exist, except as the intersection of surfaces and solids. This program teaches you good modeling practices from the very beginning by relegating 2D drafting tasks to a 3D modeling support role.

As a 3D modeler, form•Z is very versatile. In addition to the "entry-level" modeling features, form•Z program also offers the ability to create lathed objects, helixes, screws and bolts, spiral stairs and sweeps along paths. It also allows you create smooth, curved surfaces based on NURBS. In addition to supplying very powerful 3D modeling tools, the program's interface is easy to use. I particularly like the rich selection of view options, including axonometric, isometric, oblique, perspective, and panoramic views. Enhancing the program's interface is the addition of toolbar fly outs that can be torn off and placed anywhere on-screen.

A typical modeling session would involve the usual modeling of walls, then doors, windows, roof, and entourage. With form•Z you have many options as to the type of entity to create. For example, you can choose from ACIS solids, form•Z solids, surface solids, or plain surfaces. Once you have created an object, you can edit its vertices or edges and use subsets of objects for further geometry creation. If this is not enough, the program also provides metaballs, which allow you to create smooth, organic surfaces by combining spherical shapes.

Unlike Chief Architect and MiniCAD, form•Z does not provide a lot of AEC industry-specific content. On the other hand, it does provide all the tools necessary to create an architectural model from scratch. It is a very conceptually rich program, covering all the major 3D modeling methods, which should appeal to intermediate and advanced users willing to spend the time required to learn more flexible and powerful tools. The documentation reads like a 3D modeling 101 class. Studying this program is analogous to learning Pascal, a low-level computer language that was originally intended as a good-programming-practice teaching tool. With form•Z you are gently guided into 3D modeling first and then work your way to extracting 2D views for documentation later on-a faster and more accurate method than drawing in 2D and then creating a 3D model.

One of my favorite program features is the automatic terrain modeler from contour lines, which lets you create realistic project sites. You have the choice of a rectangular matrix mesh or triangulated mesh model, a stepped model, and a triangulated contour



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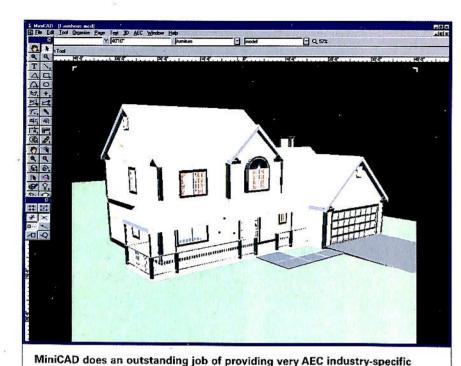
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model. This is a feature usually found only in more expensive programs. The company's claim that form•Z can create virtually any physical form imaginable is well founded; however, prepare to invest some time learning the program and perfecting your technique. The program's interface and

content while still providing a solid, thorough tool set.

concepts are very reminiscent of 3D Studio MAX, and it is able to export DXF and 3DS files.

### MiniCAD

The minimum hardware requirements for running MiniCAD are Windows 3.1, 95 or NT. It will run on a 486 or Pentium-based computer, and a full installation takes only 30MB of HDD space. The program will run with as little as 4MB of RAM after Windows is loaded. Therefore, 12MB of RAM should work well, but the more memory you have installed, the better.

MiniCAD lets you import AutoCAD R13 or earlier DWG and DXF files. You have the choice of converting to 2D objects or native MiniCAD 3D objects. You can also export R13 DWG and DXF files or print to any Windows System Printer device. The program also includes a Macintosh version, which

was MiniCAD's original platform. This is helpful for those transitioning between platforms.

The program's interface takes a little getting used to. For example, fly-out buttons are selected by right-clicking them. This is different than the usual click-and-drag method used to select button in fly-out toolbars expected in Windows-compliant programs. Furthermore, most MiniCAD tools use a click-and-drag, instead of a click-and-click, method. Fortunately, this can be changed in the program's preferences. Once I got used to these minor adjustments, I actually liked them.

A typical 3D modeling session consists of creating closed 2D polygons or double lines that can then be extruded and turned into 3D walls. The extrusion height can either default to the current layer's delta Z value or can be specified with the Extrude tool in the Model pull-down menu. A nice feature of the resulting extrusions is that they can be edited at any time, using the 3D reshape tool. This also allows you to type in the dimensions for precisionbased modeling. You can then combine solid extrusions into more complex shapes using Boolean operators. Unfortunately, these commands do not currently work with walls.

MiniCAD does an outstanding job of providing very AEC industry-specific content while still providing a solid, thorough tool set. The company's elegant concept of hybrid objects makes it easy for beginners to work in 2D while the program is actually creating a 3D model that is only one or two clicks away. Hybrid objects consist of two simultaneous versions. One is a regular 2D version meant to be viewed in plan view. The other is a 3D model of the same part viewed in 3D perspective, orthogonal, or isometric views as well as in sections or elevations. This tricks the user into thinking they are working in 2D, however, they are really creating in 3D. The program provides a resource window for drag and drop placement of 2D, 3D, or 2D/3D hybrid objects and comes with an extensive library of predefined components that are ready to be

A good example of a useful application of the hybrid object concept is the Roof Creation Tool. This tool lets you

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tel: 800-482-4433 or 208-664-4204 fax: 208-664-1316

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form•Z (\$1,495) auto•des•sys Inc. tel: 614-488-9777

fax: 614-488-0848 www.formz.com READER SERVICE NO. 181

MiniCAD (\$795)

Diehl Graphsoft Inc. tel: 410-290-5114 fax: 410-290-8050

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3D Studio VIZ (\$1,995) Kinetix

tel: 415-547-2000 fax: 415-547-2222

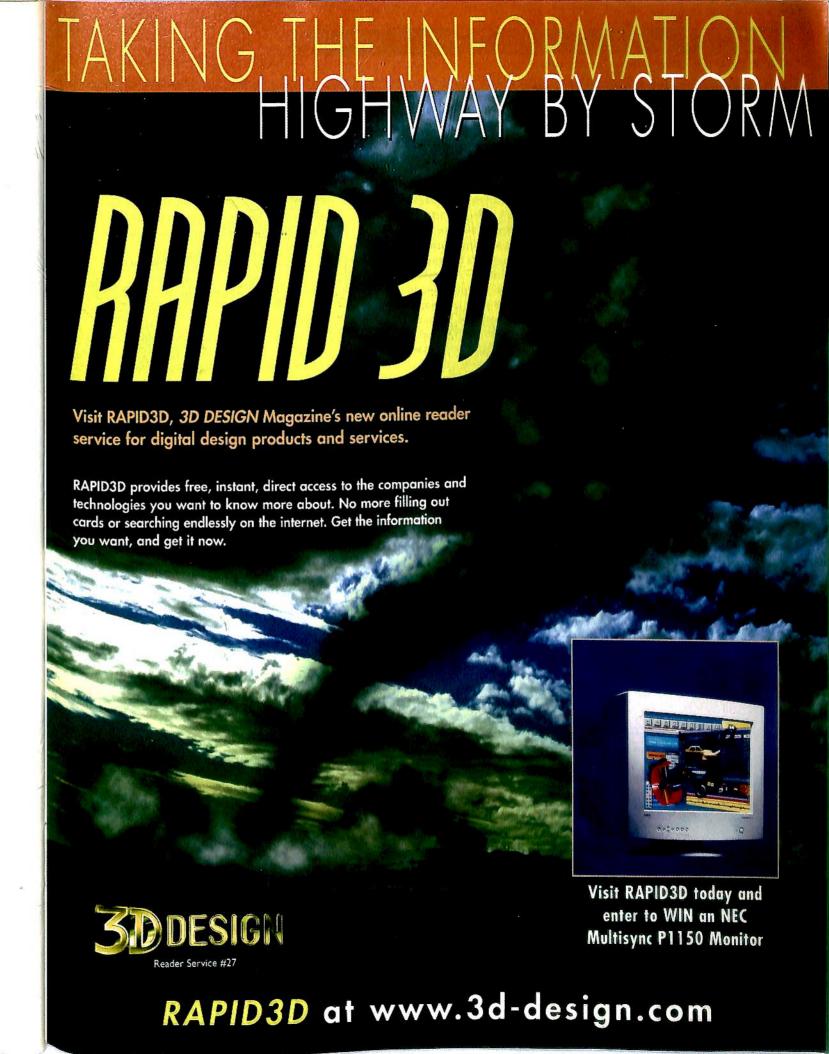
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convert a 2D shape, such as a closed polyline, into a 3D roof, while retaining both the 2D and 3D versions. You can then selectively use the 2D version for plan views and the 3D version for elevations or presentation drawings. The Create Roof tool lets you define an arbitrary roof slope, rafter thickness, and rafter tail miter type. This automatic method works well for conventional gable and hip-and-valley roof systems. For other unconventional roofs, the more tedious but flexible and powerful extrude and sweep 3D tools are the way to go.

MiniCAD's name is deceiving because there is nothing "mini" about its 2D and 3D design capabilities. Not only does it offer solutions for archi-

tects, it offers solutions for the mechanical and electrical engineering fields too. Its 3D creation tools are also quite complete, allowing you to either drag and drop objects into your scene or letting you create them from scratch. MiniCAD's Apple Macintosh origins make it an easy program to learn and to use. I especially like the movie files that explain a majority of the commands and procedures, which makes it like a having a full-time tutor by your side. While the tutorials were helpful, they were not plentiful. In the future, it would be great to see more industryspecific, task-based tutorials included with the program to help familiarize new and existing users with the features of the program.

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TABLE 1.	Chief Architect	ConceptCAD	form•Z	MiniCAD	3D Studio VIZ
Price	\$895	\$1,595	\$1,495	\$795	\$1,995
	4 T. T. T.	4.755	41/100	1000000	
Import					
3D DXF	N	Υ	Υ	Υ	Y
DWG	N	N	Υ	Υ	Υ
3DS	N	Υ	Υ	N	Υ
MAX	N	N	N	N	Υ
Export					
DXF	Υ	Y	Υ	Υ	Y
DWG	N	N	Υ	Υ	Υ
3DS	N	Y	Υ	N	Υ
MAX	N	N	N	N	Υ
Learning Tools					
CD-ROM/On-line Tutorial	N	Υ	Υ	Υ	Υ
Printed documentation	Υ	Y	Y	Υ	Υ
On-line help	Υ	Υ	Υ	Y	Y
On-line documentation	N	Y	Υ	Υ	Y
3D Modeling Type					
ACIS solid			15000	27.900	Nova:
Solid	N	N	Υ	Υ	Υ
Surface	N Y	N	Υ	Υ	Υ
Surface	Y	Y	Υ	Υ	Υ
3D Modeling Method					
Drag and Drop	Υ	Υ	Υ	Υ	Υ -
Parametric Objects	Υ	N	Υ	Ý	Y
Extrude	N	Y	Υ	Y	Ý
Revolve	N	N	Υ	Υ	Ý
Boolean	N	N	Υ	Y	Y
					878

#### The Verdict

The disparity between 3D modeling applications is becoming almost nonexistent as more software programs incorporate similar 3D feature sets and modeling tools. This is great news for people interested in making the move to 3D. What you learn in one 3D modeling and animation program will apply to

But in the here-and-now, which of the above programs is best suited for your needs? Below are my thoughts:

- If you are changing platforms-for example, from Mac to Wintel-form•Z or MiniCAD are ideal.
- If you need a complete solution to your 2D documentation and 3D modeling needs, 3DS VIZ-when combined with a complementary 2D program, such as AutoCAD LT-is a good choice.
- If you are looking for ease of use, Chief Architect feels as easy to use as a game. However, it doesn't offer much flexibility when importing and exporting 2D and 3D files.
- · If you need a good 3D conceptualization tool for models and walkthroughs, ConceptCAD is a unique and welcome solution. 3D Studio VIZ and form•Z also offer good conceptualization tools.
- · If you are looking for ease of use and sheer modeling power, 3D Studio VIZ is the perfect solution.

Whatever your 3D modeling needs, don't wait to convert from 2D to 3D. With an assortment of software solutions on the market to satisfy practically every architect's design requirements and preferences, there appears to be something for everyone.

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Emmanuel Garcia is a consulting CAD manager and trainer in Southern California, specializing in 3D modeling and design visualization. He can be reached at 3DGuru@compuserve.com. Teresa Woods de Garcia is a freelance writer in Southern California.

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- 45. Silicon Graphics Workstation 146 Sun Workstation
- 47. Hewlett Packard Workstation G. What is your primary software platform?

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218 219

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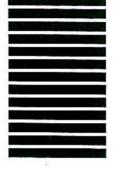
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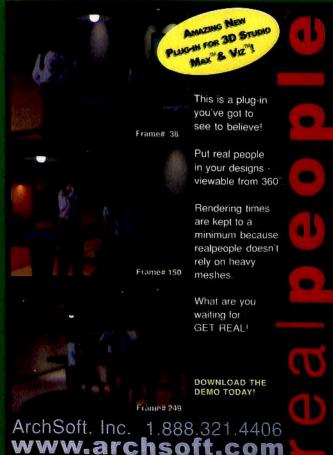
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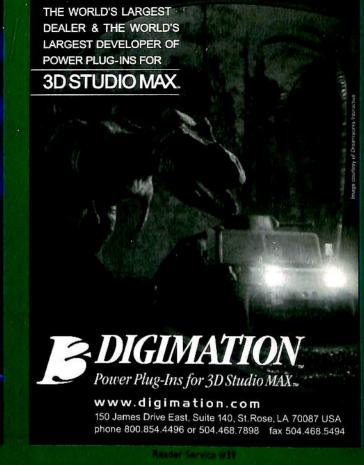
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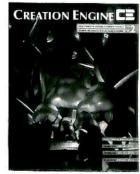
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THIRD



### IMENSIUN ...

by Dan Ablan

### Wind Power

very once in a while, a project comes along that falls surprisingly above average on the fun scale. I recently did a job for a client (for an infomercial, no less) demonstrating how a patented new roofing material helps airflow within a house. The project required that I rebuild the roofing structure to show how the outside cool air travels over the roof, sucking out the warm air from inside. It was a good challenge to create convincing wind that looped seamlessly. While experimenting with different ways of creating the look for the wind, I realized that some triedand-true LightWave tricks would be perfect for the task.

In this tutorial, we'll take the techniques I developed for the roofing infomercial a step further—we'll add a bit more flare by creating a car undergoing aerodynamic tests in a wind tunnel. Figure 1 shows the final image with wind sweeping up and over the hood of the car.

START YOUR ENGINES To begin with, we'll be using purely 100% LightWave for this project. Although plug-ins are great additions, many animators (or their employers) simply can't afford to buy third-party products for every situation. For this tutorial, I knew that Light-Wave's fractal noise would work perfectly, given the right settings. The majority of the time spent in setting up this animation was primarily for "T2" (tweaking and testing). Change a set-

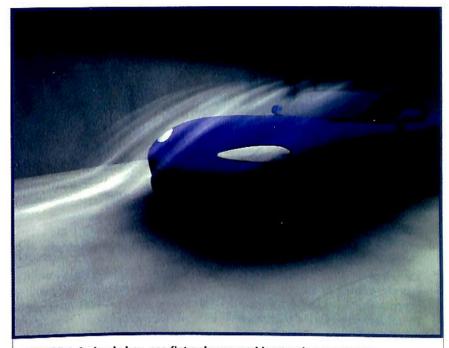


FIGURE 1. A simple box, car, flat polygon, and bent polygon create a believable wind tunnel effect with the help of fractal noise and Metamorph.

ting—test it. Change the setting again—test it again, and so on.

Due to the nature of our star performer—the wind—this job requires that we use a transparent fractal noise pattern, which can't be seen in Layout. This means that we need to render a frame to see the procedural texture. More importantly, we need to render a short animation to test the movement (velocity) of the wind texture. However,

If your next animation project calls

for some cutting-edge wind effects,

you can create blustery skies, sand

storms, snow drifts, and much more.

look no further. With a little help from

LightWave's animated fractal noise maps.

it is worth the time spent to get the correct values because it results in the perfect effect.

If you have Internet access, you can

If you have Internet access, you can download a version of the files I used here from 3D Design's web site at www.3d-design.com so you can follow along. This tutorial simply requires a car, a room, and some time

**CREATING THE WIND** First, enter LightWave's Modeler and make a box, which will become the surfaced wind object. Use the following settings:

	Low	High	Segments
X	-4.5737m	18.56m	14
Y	1.8681m	1.8681m	1
Z	-9.6777m	7.7555m	32

Click OK, then press Enter to make the box. You should have something like the flat, segmented box shown in Figure 2.

To make the wind travel towards the

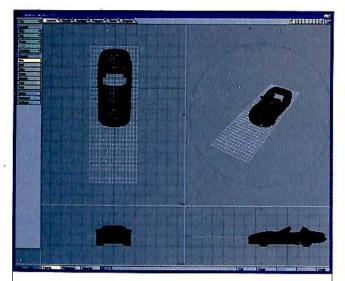


FIGURE 2. A flat, segmented box will become the surfaced wind object

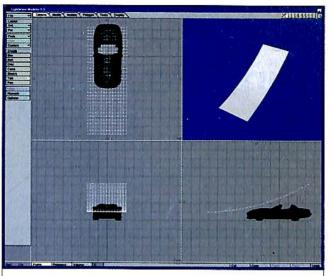


FIGURE 3. Using the bend tool on the object begins to form the curved wind object.

front of the car and up and over the hood, you need to bend the polygon. If the texture we're working with—in this situation the wind—is mapped on a flat plane and moving along the X-axis, bending the polygon so that a portion of it occupies the Y-axis changes everything. The texture can't travel on X, then Y, then X again. So, by making a flat object (in this case, the wind), surfacing it, then morphing it into a bent object, the texture remains intact along the bent path. As a note, you could use bones to bend the object as well, but I've found that for something such as a wind effect, modeling the morph target is simpler.

While working with the wind, I couldn't figure out why everything about the texture was working perfectly except for the area that traveled up the front of the car. The answer was in the linear mapping techniques of the fractal noise. the pattern can only move in a linear fashion on the X, Y, or Z. It can't curve up the Y from the X to the X. After racking my brain, I realized that I had forgotten to use a Metamorph. If you worked with LightWave in its early days using the Toaster card, you may remember the Saturn Rings tutorial, which explained

LightWave NewTek Inc. tel: 210-370-8000 www.newtek.com READER SERVICE NO. 186 how to make a straight image map curve with an object through the use of a Metamorph. The same principle applies here.

Back in Modeler, press the a key to open the Change Surface requester. Give the flat, segmented box a surface name of "wind" and color it white. Click Apply and save the object as Wind Flat.lwo or something similar.

Now, you need to bend the object to form the shape of the car. This bent object is the path the wind will take. From the Modify panel, select the Bend tool. In the face view, left-click on the flat, segmented box and move upward. You'll see the object curve as in Figure 3. Now, select the polygons of the curved object that make up the area just covering the car, as in Figure 4.

Select the Bend tool and, from the face view, left-click and drag down. At this point, you may want to zoom in close. From the left view, drag the lines of points to smooth out the shape of the wind over the hood of the car. Figure 5 shows a close-up of the final curved wind object, and Figure 6 shows the fullsize final wind object.

Save the object as Wind\_Curve.lwo. Don't change the surface name. This is key, because you want to surface the original flat object and have the same texture for both objects. The Metamorph feature in LightWave simply takes the point order of the curved object to displace the shape of the flat object.

In Layout, load your car object, then

the Wind\_Flat.lwo and the Wind\_Curve.lwo object files. At this point, you're ready to begin surfacing the wind objects. Because I've gone through the steps already, and done the necessary "T2" work, you can apply these settings to your own objects. Now the fun part begins!

**ALL ON THE SURFACE** First off, you need to set up the Metamorph. In the Objects panel, select the Wind\_Flat.lwo object file as the Current Object. Under the Deformations tab (a feature of Light-Wave 5.5), select Wind Curve.lwo as the Morph Target, then, set the Morph Amount to 100%. This morphs the flat object to the curved object.

Next, make the Current Object Wind\_Curve.lwo. Switch to the Appearance Options (still in the Objects panel) and set a 100% dissolve for the Wind\_Curve.lwo object. LightWave only uses the point order of this object for the animation, so you don't need to see it.

Close the Objects panel and return to Layout. Save your scene as Wind-Tunnel.lws or something similar. Applying the surfaces, as mentioned, takes a little time to set correctly. It took me about an hour or so to get the wind to look and move the way I wanted. Here are the settings I used for the wind surface:

Surface Color Luminosity Luminosity

200, 200, 200 0% Texture Map

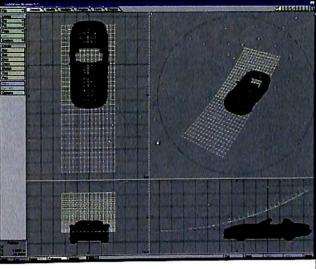


FIGURE 4. A flat, segmented box is curved to create the final wind object.

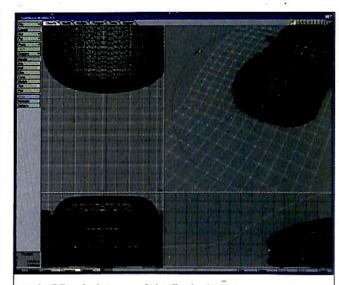


FIGURE 5. A close-up of the final wind object to see how it curves over the hood of the car.

Fractal Noise Texture Type Texture Size Texture Value Frequencies Contrast Small Power Diffuse Level Specularity Reflectivity Transparency Texture Type **Texture Opacity** Texture Size Texture Falloff

Texture Velocity Texture Value Frequencies Contrast Small Power

X 50cm Y 50cm Z 5m 85% 3 1.0 1.5 100% 0% 0% 100% Fractal Noise 100% X 50cm Y 50cm Z 5m X 12.0 Y 1.0 Z 7.0 X0Y0Z1m 0%

1.0

0.5

The velocity setting of 1m on the Z-axis is what animates the texture. For variation, you can add a value of .2 on the X-axis to make the fractal noise pattern "sway" a bit as it travels over the car. Lastly, what you need to

do is tell LightWave not to use shadows with the wind objects. In the Objects panel, turn off the Self, Cast, and Receive shadows buttons for both the Wind\_Flat.lwo and Wind\_Curve.lwo object files. Make a small .avi or preview animation to see how the

wind moves across the hood of the car. From here, work with your lighting and animate the camera.

#### **BROADENING YOUR HORIZONS This**

technique of creating wind in a wind tunnel is only one thing you can do with animated transparent fractal noise maps. Using the same technique with variations, you can create wisps of clouds in the sky, sand storms in a dessert, snow drifts in the winter, and much, much more.

You don't have to animate the texture velocity, either. Perhaps you have a

winding road that needs streaks of grease and dirt. Use this transparent fractal noise texture with a Metamorph to add the random dirt you need.

You can even darken the texture and make it dirt or slime oozing down a wall in a haunted house. The elements that make up this tutorial are simple, yet can be used in many animations. The technique of morphing a flat plane to a curved plane to maintain texture placement is a LightWave trick that has worked in every version of the software.

As you work with LightWave, the more projects you tackle, the stronger,

and more knowledgeable you'll become. Each project you take on will become another step in your effort to create that perfect 3D animation. 30

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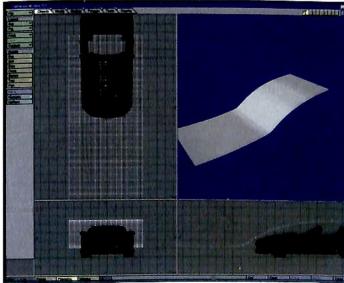


FIGURE 6. The final curved wind object.



### Taking It To the MAX

n the business of creating 3D software, companies must live by the rule of innovate or die trying. Many companies have embraced this philosophy and are set to release the next wave of almighty 3D design and content creation tools during the course of the year: There is Alias|Wavefront's impending release of Maya, Softimage's longawaited Sumatra, and the highlyrumored release of NewTek's LightWave 6. Even companies such as Nichimen have stepped up to the plate with its next generation tool that promises to take 3D modeling and animation to new heights. But hey, what about Kinetix? What does a company do after releasing MAX R2—one of the most feature-laden software upgrades in history? Keep striving for more, obviously.

By the release of this issue, Kinetix will be shipping MAX R2.5, and Character Studio R2.0 (CSR2) en masse. The good news to the 3D designer using these tools is that these are substantial upgrades to the previous versions of the software. Even better is that it's a \$99 upgrade, but if you ask me, the upgrade is worth ten times the price. This should make the over 50,000 users of 3D Studio MAX very happy indeed. For those users buying their first copy, the price is the same-\$3,495 for MAX, and \$995 for Character Studio.

But what makes this version of 3D Studio MAX better than the rest? As you might expect, there are many new features, but a major one includes radically improved NURBS (non-uniform rational B-splines), which include 95% of all the features you need for great NURBS modeling. The inclusion of trims, blends, curves on surfaces, and much more makes MAX a great NURBS mod-

eler. Even the awesome new tools for polygonal modeling are improved, and coincidentally, they are similar to the power tools found in Nichimens' N•World modeler. Additionally, features such as edge extrusions, interactive capping of surfaces, splits, and excellent smoothing controls should make 3D game modelers quite happy. 3D camera tracking controls have also radically improved, allowing you to match move your source video to 3D elements with unparalleled ease. For those of you who are reliant on your plug-in enhance-

In less than six months from the release of 3D Studio **MAX R2, Kinetix** upgrades to MAX R2.5—offering 3D artists new interoperability with Discreet Logic, radically improved **NURBS** modeling. muscular mocap and more.

ments, you'll be happy to hear that all the 3D Studio MAX R2 plug-ins will work with MAX R2.5.

QuickTime 3.0 is supported in MAX R2.5 as well as the .rla animation format. Kinetix has also partnered with Discreet Logic and has made MAX interoperable with Discreet's next generation paint and compositing packages. By rendering to the .rla format, MAX records not only Alpha information, but Z-depth, object locations, and 3D pixel positions. You might be thinking—"So what?" Well, the combination lets you import animation into Discreet Paint and render depth of field, motion blur, lens effects and more-all in real-time! You can pass a lens flare behind objects or set motion blur with incredible control, and do it in real-time. This combo eliminates the high overhead that rendering special effects can demand.

> CSR2 has greatly improved its animation tool set. In this version, motion capture editing and lavering are very robust and have useful keyframe optimization tools. Physique controls are much easier to set and manipulate, and vertices can be weighted for better control. The footstep driven animation is much easier to use, and the motion of the characters is far more realistic and very easy to manipulate. Motion sets can be edited separately in layers, then blended together to get a wide variety of different moves. In addition, CSR2 comes with 150 motion capture files right out of

Kinetix seems to have once again shown its commitment to the world of 3D design by releasing a significant upgrade to 3DS MAX R2.0 less than six months after it shipped. This is sure to make many a 3D Studio user or potential customer jump for joy, or better yet, do the "ooga booga" like the infamous Baby Cha.

Kinetix seems to enjoy pushing 3D to the max, and users wouldn't want it any other way. 30

Chris Tome is the technical editor of 3D Design. Send your feedback and comments to him at ctome@mfi.com.

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